U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 53

JULY–DECEMBER, 1925

COLLEGE AND RESEARCH
26 MAY 1938

WASHINGTON
GOVERNMENT PRINTING OFFICE
1926

U. S. DEPARTMENT OF AGRICULTURE

Scientific Bureaus

WEATHER BUREAU—C. F. Marvin, *Chief.*
BUREAU OF ANIMAL INDUSTRY—J. R. Mohler, *Chief.*
BUREAU OF PLANT INDUSTRY—W. A. Taylor, *Chief.*
FOREST SERVICE—W. B. Greeley, *Forester.*
BUREAU OF CHEMISTRY—C. A. Browne, *Chief.*
BUREAU OF SOILS—Milton Whitney, *Chief.*
BUREAU OF ENTOMOLOGY—L. O. Howard, *Entomologist.*
BUREAU OF BIOLOGICAL SURVEY—E. W. Nelson, *Chief.*
BUREAU OF PUBLIC ROADS—T. H. MacDonald, *Chief.*
BUREAU OF AGRICULTURAL ECONOMICS—T. P. Cooper, *Chief.*
BUREAU OF HOME ECONOMICS—Louise Stanley, *Chief.*
BUREAU OF DAIRYING—C. W. Larson, *Chief.*
FIXED NITROGEN RESEARCH LABORATORY—F. G. Cottrell, *Director*

OFFICE OF EXPERIMENT STATIONS—E. W. Allen, *Chief*

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—
College Station: *Auburn;* M. J. Funchess.[1]
Canebrake Station: *Uniontown;* W. A. Cammack.[1]
Tuskegee Station: *Tuskegee Institute;* G. W. Carver.[1]
ALASKA—*Sitka:* C. C. Georgeson.[1]
ARIZONA—*Tucson:* J. J. Thornber.[1]
ARKANSAS—*Fayetteville:* D. T. Gray.[1]
CALIFORNIA—*Berkeley:* E. D. Merrill.[1]
COLORADO—*Fort Collins:* C. P. Gillette.[1]
CONNECTICUT—
State Station: *New Haven;* } W. L. Slate, jr.[1]
Storrs Station: *Storrs;* }
DELAWARE—*Newark:* C. A. McCue.[1]
FLORIDA—*Gainesville:* W. Newell.[1]
GEORGIA—
Experiment: H. P. Stuckey.[1]
Tifton: Coastal Plain Station; S. H. Starr.[1]
GUAM—*Island of Guam:* C. W. Edwards.[1]
HAWAII—
Federal Station: *Honolulu;* J. M. Westgate.[1]
Sugar Planters' Station: *Honolulu;* H. P. Agee.[1]
IDAHO—*Moscow:* E. J. Iddings.[1]
ILLINOIS—*Urbana:* H. W. Mumford.[1]
INDIANA—*La Fayette:* G. I. Christie.[1]
IOWA—*Ames:* C. F. Curtiss.[1]
KANSAS—*Manhattan:* L. E. Call.[1]
KENTUCKY—*Lexington:* T. P. Cooper.[1]
LOUISIANA—
State Station: *Baton Rouge;* }
Sugar Station: *Baton Rouge;* }
North La. Station: *Calhoun;* } W. R. Dodson.[1]
Rice Station: *Crowley;* }
Fruit and Truck Station: *Hammond;* }
MAINE—*Orono:* W. J. Morse.[1]
MARYLAND—*College Park:* H. J. Patterson.[1]
MASSACHUSETTS—*Amherst:* S. B. Haskell.[1]
MICHIGAN—*East Lansing:* R. S. Shaw.[1]
MINNESOTA—*University Farm, St. Paul:* W. C. Coffey.[1]
MISSISSIPPI—*A. and M. College:* J. R. Ricks.[1]
MISSOURI—
College Station: *Columbia;* F. B. Mumford.[1]
Fruit Station: *Mountain Grove;* F. W. Faurot.[1]
Poultry Station: *Mountain Grove;* T. W. Noland.[1]
MONTANA—*Bozeman:* F. B. Linfield.[1]
NEBRASKA—*Lincoln:* E. A. Burnett.[1]
NEVADA—*Reno:* S. B. Doten.[1]
NEW HAMPSHIRE—*Durham:* J. C. Kendall.[1]
NEW JERSEY—*New Brunswick:* J. G. Lipman.[1]
NEW MEXICO—*State College:* Fabian Garcia.[1]
NEW YORK—
State Station: *Geneva;* } R. W. Thatcher.[1]
Cornell Station: *Ithaca;* }
NORTH CAROLINA—*State College Station, Raleigh:* R. Y. Winters.[1]
NORTH DAKOTA—*State College Station, Fargo:* P. F. Trowbridge.[1]
OHIO—*Wooster:* C. G. Williams.[1]
OKLAHOMA—*Stillwater:* C. T. Dowell.[1]
OREGON—*Corvallis:* J. T. Jardine.[1]
PENNSYLVANIA—
State College: R. L. Watts.[1]
State College: Institute of Animal Nutrition; E. B. Forbes.[1]
PORTO RICO—
Federal Station: *Mayaguez;* D. W. May.[1]
Insular Station: *Rio Piedras;* R. M. Ramos.[1]
RHODE ISLAND—*Kingston:* B. L. Hartwell.[1]
SOUTH CAROLINA—*Clemson College:* H. W. Barre.[1]
SOUTH DAKOTA—*Brookings:* J. W. Wilson.[1]
TENNESSEE—*Knoxville:* C. A. Mooers.[1]
TEXAS—*College Station:* B. Youngblood.[1]
UTAH—*Logan:* William Peterson.[1]
VERMONT—*Burlington:* J. L. Hills.[1]
VIRGINIA—
Blacksburg: A. W. Drinkard, jr.[1]
Norfolk: Truck Station; T. C. Johnson.[1]
VIRGIN ISLANDS—*St. Croix:* J. B. Thompson.[1]
WASHINGTON—
College Station: *Pullman;* E. C. Johnson.[1]
Western Station: *Puyallup;* J. W. Kalkus.[2]
WEST VIRGINIA—*Morgantown:* H. G. Knight.[1]
WISCONSIN—*Madison:* H. L. Russell.[1]
WYOMING—*Laramie:* J. A. Hill.[1]

EXPERIMENT STATION RECORD

Editor: H. L. KNIGHT

EDITORIAL DEPARTMENTS

Agricultural Chemistry and Agrotechny—SYBIL L. SMITH.
Meteorology—W. H. BEAL.
Soils and Fertilizers—R. W. TRULLINGER.
Agricultural Botany, Bacteriology, and Plant Pathology—W. H. EVANS, Ph. D., W. E. BOYD.
Genetics—W. H. EVANS, W. E. BOYD, H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Foods and Human Nutrition—SYBIL L. SMITH.
Animal Husbandry, Dairying, and Dairy Farming—G. HAINES.
Veterinary Medicine—W. A. HOOKER, SYBIL L. SMITH.
Agricultural Engineering—R. W. TRULLINGER.
Rural Economics and Sociology and Agricultural Education—LOUISE MARBUT.
Indexes—MARTHA C. GUNDLACH.
Bibliographies—MARTHA L. GERICKE.

CONTENTS OF VOLUME 53

EDITORIAL NOTES

	Page
The Purnell Act and cooperative investigations in agriculture	1
Advanced degrees held by agricultural economics and home economics workers	6
Bibliographical aid by the Federal Department of Agriculture to agricultural research	101
A visualization of the experiment station system	301
An important decade of agricultural college history	401
The semicentennial of the Connecticut State Station	601
The thirty-ninth convention of the Association of Land-Grant Colleges	701

STATION PUBLICATIONS ABSTRACTED

	Page
ARIZONA STATION:	
Bulletin 101	281
Bulletin 102	418
Bulletin 103	433

ARIZONA STATION—*Continued*. Page
Bulletin 104 419
Technical Bulletin 5 421
Timely Hints for Farmers No. 150 234
Thirty-third Annual Report, 1922 ..... 733, 734, 740, 745, 754, 757, 769, 773, 789, 798

ARKANSAS STATION:
Bulletin 195 435
Bulletin 196 465

CALIFORNIA STATION:
Bulletin 386 37
Bulletin 387 354
Bulletin 388 614
Bulletin 389 633
Bulletin 390 690
Circular 282 52
Circular 283 241
Circular 284 344
Circular 285 534
Circular 286 590
Circular 287 532
Circular 288 537
Circular 289 754
Circular 290 737
Circular 291 787
Circular 292 719
Circular 293 744
Circular 294 843
Hilgardia, vol. 1—
No. 1, May, 1925 430
No. 2, May, 1925 458
No. 3, May, 1925 453
No. 4, May, 1925 476
No. 5, June, 1925 725
No. 6, June, 1925 744
No. 7, June, 1925 788
Technical Paper 18 22
Technical Paper 19 180
Technical Paper 20 324
Annual Report, 1924 ..... 419, 420, 425, 430, 436, 446, 448, 449, 477, 496

COLORADO STATION:
Thirty-seventh Annual Report, 1924 ..... 117, 135, 143, 146, 154, 179, 184, 185, 194

CONNECTICUT STATE STATION:
Bulletin 264 (Report, 1924) 434, 441, 496
Bulletin 265 450
Bulletin 266 629
Bulletin 267 657
Bulletin 268 666
Forty-seventh Report, 1923 96

CONNECTICUT STORRS STATION: Page
Bulletin 125 80
Bulletin 126 737, 751
Bulletin 127 797
Bulletin 128 785
Bulletin 129 837
Bulletin 130 887
Bulletin 131 808
Thirty-sixth Annual Report, 1924 299

DELAWARE STATION:
Bulletin 140 353

GEORGIA STATION:
Thirty-seventh Annual Report, 1924 230, 239, 246, 272, 299

GUAM STATION:
Report 1923 413, 430, 436, 468, 496

HAWAIIAN SUGAR PLANTERS' STATION:
Agricultural and Chemical Series Bulletin 49 829
Entomological Series Bulletin 17 551

IDAHO STATION:
Bulletin 136 509, 511, 514, 528, 599

ILLINOIS STATION:
Bulletin 255 (abridged) 349
Bulletin 256 353
Bulletin 257 168
Bulletin 258 17
Bulletin 259 32
Bulletin 260 68
Bulletin 261 88
Bulletin 262 71
Bulletin 263 176
Bulletin 264 349
Bulletin 265 355
Bulletin 266 434, 444
Bulletin 267 489
Bulletin 268 533
Bulletin 269 690
Bulletin 270 675
Circular 294 71
Circular 295 78
Circular 296 599
Circular 297 555
Circular 298 723
Circular 299 850
Soil Report 29 720

INDIANA STATION:
Bulletin 289 175
Bulletin 290 177
Bulletin 291 465
Bulletin 292 724
Bulletin 293 779
Circular 121 456

	Page
INDIANA STATION—Continued.	
Circular 122	454
Circular 123	419, 431, 497
Circular 124	792
Thirty-seventh Annual Report, 1924	130, 139, 146, 154, 167, 172, 179, 184, 189, 194
IOWA STATION:	
Bulletin 226	436
Bulletin 227	435
Bulletin 228	636
Bulletin 229	687
Research Bulletin 82	747
Research Bulletin 83	776
Research Bulletin 84	749
Research Bulletin 85	781
Research Bulletin 86	777
Circular 93	390
Circular 94	76
Circular 95	94
Circular 96	89
Circular 97	420
Soil Survey Report 35	510
Soil Survey Report 36	510
Soil Survey Report 37	510
Annual Report, 1924	730, 734, 741, 746, 747, 753, 754, 755, 768, 770, 773, 774, 778, 779, 782, 788, 789, 797, 798
KANSAS STATION:	
Technical Bulletin 15	531
Circular 110	377
Circular 111	398
Circular 112	370
Circular 113	453
Circular 114	534
Fort Hays Substation, Dairy Cattle Investigations, 1924–25	779
KENTUCKY STATION:	
Bulletin 251	420
Bulletin 255	391
Bulletin 257	269
Bulletin 258	739
Circular 35	259
LOUISIANA STATIONS:	
Bulletin 193	850
Annual Report, 1924	514, 528, 536, 553, 599
MAINE STATION:	
Bulletin 320	375
Bulletin 322	342
Official Inspections 114	535, 539
MARYLAND STATION:	
Bulletin 271	448
Bulletin 272	559
Bulletin 273	877
Thirty-seventh Annual Report, 1924	332, 398

MASSACHUSETTS STATION: Page
Bulletin 216 (popular edition) 572
Bulletin 221 444
Bulletin 222 446
Bulletin 223 473
Bulletin 224 490
Control Series Bulletin 29 22
Control Series Bulletin 30 22
Control Series Bulletin 31 889
Meteorological Bulletins 435–436, March-April, 1925 113
Meteorological Bulletins 437–438, May-June, 1925 413
Meteorological Bulletins 439–440, July-August, 1925 719

MICHIGAN STATION:
Special Bulletin 137 91
Special Bulletin 138 243
Special Bulletin 139 94
Special Bulletin 140 37
Special Bulletin 141 40
Special Bulletin 142 39
Special Bulletin 143 343
Special Bulletin 144 354
Special Bulletin 145 345
Special Bulletin 146 440
Special Bulletin 147 448
Technical Bulletin 67 751
Quarterly Bulletin—
Volume 7—
No. 4, May, 1925 339, 341, 346, 355, 374, 376, 379, 387, 392, 398
Volume 8—
No. 1, August, 1925 726, 740, 743, 773, 780, 781, 787, 792, 795, 798
Circular 67 158
Circular 68 557
Circular 69 536

MINNESOTA STATION:
Bulletin 218 76
Bulletin 219 575
Technical Bulletin 23 385
Technical Bulletin 24 180
Technical Bulletin 25 425
Technical Bulletin 26 489
Technical Bulletin 27 551
The Minnesota Agricultural Experiment Station 209
Thirty-second Annual Report, 1924, pt. 2 465, 467, 469, 472, 477, 497
Crookston Substation Report, 1923 113, 119, 130, 136, 139, 149, 150, 169, 170, 174, 194
Morris Substation Report, 1923 113, 119, 131, 140, 171, 195

MISSISSIPPI STATION:
Bulletin 223 131, 195
Bulletin 224 332, 341, 398
Bulletin 225 211, 231, 239, 290
Bulletin 226 234
Circular 54 56
Circular 55 136
Circular 56 33

	Page
MISSISSIPPI STATION—Continued.	
Circular 57	35
Circular 58	37
Circular 59	40
MISSOURI STATION:	
Bulletin 224	70
Bulletin 225	71
Bulletin 226	66
Bulletin 227	58
Bulletin 228 (Annual Report, 1924)	414, 426, 431, 436, 442, 444, 446, 447, 450, 457, 462, 464, 466, 468, 470, 471, 473, 479, 480, 482, 493, 495, 497
Bulletin 229	235
Bulletin 230	220
Bulletin 231	241
Bulletin 232	241
Research Bulletin 70	76
Research Bulletin 71	77
Research Bulletin 72	38
Research Bulletin 73	464
Circular 131	287
Circular 132	234
Circular 133	273
MONTANA STATION:	
Bulletin 169	70
Bulletin 170	51
Bulletin 171	136
Bulletin 172	417
Bulletin 173	742
Bulletin 174	720
Bulletin 175	793
Bulletin 176	771
Bulletin 177	790
Circular 127	279
Circular 128	236
Circular 129	791
NEBRASKA STATION:	
Bulletin 205	189
Bulletin 206	433
Bulletin 207	445
Bulletin 208	593
Research Bulletin 29	351
Research Bulletin 30	384
Circular 25	384
NEVADA STATION:	
Bulletin 107	488
Bulletin 108	454
Annual Report, 1924	467, 477, 497
NEW HAMPSHIRE STATION:	
Bulletin 216 (Report, 1924)	431, 437, 444, 446, 447, 451, 497
Bulletin 217	637
Circular 24	445
Circular 25	447

	Page
NEW JERSEY STATIONS:	
Bulletin 404	23
Bulletin 405	22
Bulletin 406	16
Bulletin 407	37
Bulletin 408	135
Bulletin 409	220
Bulletin 410	258
Bulletin 411	256
Bulletin 412	238
Bulletin 413	220
Bulletin 414	416
Bulletin 415	666
Circular 173	37
Circular 174	37
Circular 175	53
Circular 176	345
Circular 177	847
Hints to Poultrymen, vol. 13—	
No. 6, March, 1925	29
No. 7, April, 1925	72
No. 8, May, 1925	482
No. 9, June, 1925	472
No. 10, July, 1925	877
No. 11, August, 1925	877
NEW MEXICO STATION:	
Bulletin 144	369
Bulletin 145	242
Bulletin 146	839
Bulletin 147	878
Bulletin 148	847
Thirty-fifth Annual Report, 1924	114, 131, 140, 146, 155, 169, 171, 173, 179, 185, 195
NEW YORK CORNELL STATION:	
Bulletin 438	391
Bulletin 439	675
Bulletin 440	794
Memoir 78	55
Memoir 81	727
Memoir 85	44
Memoir 86	69
Memoir 87	36
Memoir 88	348
Memoir 89	355
Memoir 90	378
Memoir 91	642
NEW YORK STATE STATION:	
Bulletin 519 (popular edition)	455
Technical Bulletin 109	424
Technical Bulletin 110	412
Technical Bulletin 111	475

98715—26——2

NORTH CAROLINA STATION: Page
Bulletin 247 — 818, 834, 847, 854, 889, 890, 894, 899
Forty-seventh Annual Report, 1924 — 723, 734, 736, 746, 755, 770, 775, 779, 786, 793, 798

NORTH DAKOTA STATION:
Bulletin 184 — 232
Bulletin 185 — 292
Bulletin 186 — 272
Bulletin 187 — 239
Bulletin 188 — 342
Bulletin 189 — 316, 333, 398
Bulletin 190 — 509, 529, 591, 599
Bulletin 191 — 838
Circular 25 — 652, 857

OHIO STATION:
Bulletin 381 — 217
Bulletin 382 (Forty-third Annual Report, 1924) — 509, 514, 516, 519, 529, 534, 535, 541, 548, 555, 566, 572, 574, 575, 576, 579, 584, 590
Bulletin 383 — 688
Bulletin 384 — 737
Bulletin 385 — 743
Monthly Bulletin, vol. 10—
No. 1–2, January–February, 1925 — 17, 39, 46, 51, 71, 89, 96
No. 3–4, March–April, 1925 — 548, 557, 577, 580, 599
No. 5–6, May–June, 1925 — 735, 740, 745, 781, 790, 797, 798
Bimonthly Bulletin, vol. 10—
No. 7, July–August, 1925 — 873, 879, 892, 895, 898, 899
A Comparison of Western Lambs, Native Ohio Mutton Lambs, and Native Ohio Fine Wool Lambs as Feeders, D. S. Bell and G. Bohstedt — 468
Improving a Corn and Tankage Ration, W. L. Robison — 470
Management for the Control of Gastro-Intestinal Parasites of Sheep, 1922 — 584

OKLAHOMA STATION:
Bulletin 150 — 31
Bulletin 151 — 68
Bulletin 152 — 66
Bulletin 153 — 427
Bulletin 154 — 435
Bulletin 155 — 420
Circular 56 — 89
Circular 57 — 66
Circular 58 — 467
Biennial Report, 1923–24 — 111, 119, 132, 141, 150, 155, 168, 169, 170, 171, 173, 177, 195

OREGON STATION:
Bulletin 211 — 418
Bulletin 212 — 642
Bulletin 213 — 638
Circular 60 — 235
Circular 61 — 440
Circular 62 — 894
Circular 63 — 819

	Page
PENNSYLVANIA STATION:	
Bulletin 190	48
Bulletin 191	287
Bulletin 192	439
Bulletin 193	733, 753
PORTO RICO DEPARTMENT OF AGRICULTURE AND LABOR STATION:	
Annual Report, 1924 (English and Spanish editions)	121, 133, 141, 147, 155, 195
RHODE ISLAND STATION:	
Bulletin 199	325
Bulletin 200	629
Bulletin 201	723
Annual Feed Circular, 1925	465
Annual Fertilizer Circular, 1924	420
SOUTH CAROLINA STATION:	
Bulletin 222	750
Bulletin 223	759
SOUTH DAKOTA STATION:	
Bulletin 211	436
TENESSEE STATION:	
Bulletin 132	47
TEXAS STATION:	
Bulletin 323	66
Bulletin 324	667
Bulletin 325	617
Bulletin 326	643
Bulletin 327	893
Circular 35	456
Circular 36	57
Thirty-fifth Annual Report, 1922	599
UTAH STATION:	
Bulletin 193	483
Bulletin 194	861
Circular 54	254
Circular 55	877
VERMONT STATION:	
Bulletin 244	667
Bulletin 245	853
VIRGINIA STATION:	
Bulletin 238	68
Bulletin 239	40
Bulletin 240	595
Technical Bulletin 28	578
Technical Bulletin 29	756
VIRGINIA TRUCK STATION:	
Bulletin 48	640
Bulletin 49	851
WASHINGTON COLLEGE STATION:	
Bulletin 188	288
Bulletin 189	216

	Page
West Virginia Station:	
Bulletin 190	770
Bulletin 192	31
Bulletin 193	96
Bulletin 194	174
Bulletin 195	671
Circular 38	488
Circular 39	455
Wisconsin Station:	
Bulletin 373 (Annual Report, 1924)	408, 411, 415, 424, 428, 432, 435, 438, 443, 451, 459, 463, 466, 470, 472, 474, 478, 483, 487, 497
Bulletin 374	232
Bulletin 375	435
Bulletin 376	621
Bulletin 377	693
Research Bulletin 61	65
Wyoming Station:	
State Farms Bulletin 4	133, 195
State Farms Bulletin 5	195
Thirty-fourth Annual Report, 1924	615, 630, 668, 673, 680, 696

UNITED STATES DEPARTMENT OF AGRICULTURE PUBLICATIONS ABSTRACTED

Bulletin 1275, Varietal Susceptibility of Oats to Loose and Covered Smuts, G. M. Reed, M. A. Griffiths, and F. N. Briggs	148
Bulletin 1284, Sorghum Smuts and Varietal Resistance in Sorghums, G. M. Reed and L. E. Melchers	751
Bulletin 1285, Truck-Farm Labor in New Jersey, 1922, J. C. Folsom	291
Bulletin 1292, Field and Crop Labor on Georgia Farms (Coastal Plain Area), L. A. Reynoldson	190
Bulletin 1293, Tillage and Rotation Experiments at Dickinson, Hettinger, and Williston, N. Dak., L. Moomaw	333
Bulletin 1298, Control of Decay in Pulp and Pulp Wood, O. Kress, C. J. Humphrey, C. A. Richards, M. W. Bray, and J. A. Staidl	356
Bulletin 1301, Report of the Northern Great Plains Field Station for the 10-year Period 1913–1922, Inclusive, J. M. Stephens et al	113, 114, 132, 140, 145, 168, 195
Bulletin 1303, The Pecan Nut Case-bearer, J. B. Gill	54
Bulletin 1309, Experiments with Small Grains on the Arlington Experiment Farm, J. W. Taylor	134
Bulletin 1316, Some Effects of Sodium Arsenite when Used to Kill the Common Barberry, E. R. Schulz and N. F. Thompson	327
Bulletin 1317, Retail Marketing of Meats, H. C. Marshall	491
Bulletin 1318, Steer Feeding in the Sugar-Cane Belt, J. R. Quesenberry	271
Bulletin 1319, Ginning Pima Cotton in Arizona, J. S. Townsend	234
Bulletin 1320, Behavior of Cotton Planted at Different Dates in Weevil-Control Experiments in Texas and South Carolina, W. W. Ballard and D. M. Simpson	336
Bulletin 1321, A Statistical Study of the Relation Between Seed-ear Characters and Productiveness in Corn, F. D. Richey and J. G. Willier	32
Bulletin 1322, Some Economic Aspects of Farm Ownership, C. L. Stewart	488

Page
Bulletin 1323, Citrus Pectin, H. D. Poore 13
Bulletin 1324, The Oviposition Response of Insects, C. H. Richardson 253
Bulletin 1325, Marketing Onions, A. E. Cance and G. B. Fiske 690
Bulletin 1326, Effect of Garlic on the Flavor and Odor of Milk, C. J. Babcock 75
Bulletin 1327, Production of Grape-Hyacinth Bulbs, D. Griffiths 144
Bulletin 1328, The Flight Activities of the Honeybee, A. E. Lundie 455
Bulletin 1329, Bamboos: Their Culture and Uses in the United States, B. T. Galloway 441
Bulletin 1330, Abbreviations Employed in Experiment Station Record for Titles of Periodicals, compiled by F. A. Bartholow 599
Bulletin 1331, The Madonna Lily, D. Griffiths 441
Bulletin 1332, Emulsions of Wormseed Oil and of Carbon Disulfide for Destroying Larvae of the Japanese Beetle in the Roots of Perennial Plants, B. R. Leach and J. P. Johnson 455
Bulletin 1333, Fattening Steers on Velvet Beans, S. W. Greene and A. T. Semple 466
Bulletin 1337, Work of the Northern Great Plains Field Station in 1923, J. M. Stephens et al 528, 535, 540, 574, 599
Bulletin 1338, The Family Living from the Farm, H. W. Hawthorne 897
Bulletin 1341, Effects of Continuous Selection for Ear Type in Corn, H. S. Garrison and F. D. Richey 830
Bulletin 1342, Effect of Feeding Green Rye and Green Cowpeas on the Flavor and Odor of Milk, C. J. Babcock 879
Farmers' Bulletin 1428, Saving Livestock from Starvation on Southwestern Ranges, C. L. Forsling 168
Farmers' Bulletin 1433, Cultivated Grasses of Secondary Importance, C. V. Piper 336
Farmers' Bulletin 1436, Why Potatoes Run Out, E. S. Schultz 45
Farmers' Bulletin 1441, Rural Planning—the Village, W. C. Nason 193
Farmers' Bulletin 1442, Storage of Sweet Potatoes, H. C. Thompson 339
Farmers' Bulletin 1443, Dairy Cattle Breeds, A. B. Nystrom 175
Farmers' Bulletin 1446, Cow-Testing Associations and Stories the Records Tell, J. C. McDowell 676
Farmers' Bulletin 1447, Citrus Fruit Growing in the Southwest, A. D. Shamel, C. S. Pomeroy, and R. E. Caryl 643
Farmers' Bulletin 1451, Making and Using Cottage Cheese in the Home, K. J. Matheson and J. M. Hoover 475
Farmers' Bulletin 1452, Painting on the Farm, H. P. Holman 287
Farmers' Bulletin 1455, Fitting, Showing, and Judging Hogs, E. Z. Russell 873
Farmers' Bulletin 1456, Homes for Birds, E. R. Kalmbach and W. L. McAtee 856
Farmers' Bulletin 1457, Packing Apples in Boxes, R. R. Pailthorp and F. S. Kinsey 895
Statistical Bulletin 7, Shipments and Unloads of Certain Fruits and Vegetables, 1918–1923 293
Statistical Bulletin 8, Carload Shipments of Fruits and Melons from Stations in the United States for the Calendar Years 1920, 1921, 1922, and 1923 91
Statistical Bulletin 9, Carload Shipments of Vegetables from Stations in the United States for the Calendar Years 1920, 1921, 1922, and 1923 91
Statistical Bulletin 10, Statistics of Potatoes and Sweet Potatoes 92

Page

Statistical Bulletin 11, Hay and Feed Statistics ... 293
Circular 337, Hot-water Treatment of Dormant and Sprouted Seed Cane, P. A. Yoder ... 23
Circular 338, Parasites and Parasitic Diseases of Dogs, M. C. Hall ... 482
Circular 339, Work of the Belle Fourche Reclamation Project Experiment Farm from 1919 to 1922, inclusive, B. Aune ... 316, 334, 345, 370, 371, 390, 398
Circular 340, Cost of Producing Field Crops, 1923, M. R. Cooper and C. R. Hawley ... 489
Circular 341, Seed Flax as a Farm Crop in 1925, A. C. Dillman, A. C. Arny, C. McKee, T. E. Stoa, and A. N. Hume ... 34
Circular 342, Work of the Umatilla Reclamation Project Experiment Farm in 1920, 1921, and 1922, H. K. Dean ... 316, 334, 371, 387, 390, 398
Circular 343, Extension Work in Agronomy, 1923, O. S. Fisher ... 695
Circular 344, Extension Work in Agricultural Engineering, 1923, G. Ervin ... 599
Circular 345, Farm-Forestry Extension: Early Development, and Status in 1923, G. H. Collingwood ... 695
Circular 346, Extension Work with Fruits, Vegetables, and Ornamentals, 1923, C. P. Close, W. R. Beattie, and F. L. Mulford ... 695
Circular 349, Extension Work in Foods and Nutrition, 1923, M. Birdseye ... 899
Circular 351, Centralized Management of a Large Corporate Estate Operated by Tenants in the Wheat Belt, W. H. Baumgartel ... 893
Circular 352, Work of the Newlands Reclamation Project Experiment Farm in 1922 and 1923, F. B. Headley, E. W. Knight, and L. E. Cline ... 812, 834, 840, 870, 889, 893, 899
Miscellaneous Circular 16, Tree Distribution under the Kinkaid Act of 1911 ... 846
Miscellaneous Circular 31, Let's Know Some Trees: Brief Descriptions of the Principal California Trees, C. H. Shinn ... 243
Miscellaneous Circular 32, Practical Farm Economics, H. C. Taylor, H. R. Tolley, and J. W. Tapp ... 95
Miscellaneous Circular 33, Some Tested Methods for Livestock Improvement, D. S. Burch ... 95
Miscellaneous Circular 34, List of Workers in Subjects Pertaining to Agriculture in State Agricultural Colleges and Experiment Stations, 1924–1925, M. A. Agnew ... 298
Miscellaneous Circular 35, Bibliography on the Marketing of Agricultural Products, compiled by E. L. Day, K. Jacobs, and M. T. Olcott ... 91
Miscellaneous Circular 36, The Wichita National Forest and Game Preserve, S. M. Shanklin and J. E. Scott ... 846
Miscellaneous Circular 37, Crop Report Regulations ... 92
Miscellaneous Circular 38, The Agricultural Outlook for 1925 ... 92
Miscellaneous Circular 39, Report of the National Conference on Utilization of Forest Products ... 347
Miscellaneous Circular 41, Estimating the Quantity of Grain in Bins, E. N. Bates ... 895
Miscellaneous Circular 42, How to Pick Chickens ... 878
Cooperative Extension Work, 1923 ... 298
Inventory 74, Seeds and Plants Imported by the Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry, January 1 to March 31, 1923 ... 728
Laws Applicable to the United States Department of Agriculture, 1923, compiled by O. H. Gates ... 299

LIBRARY: Page

Bibliographical Contributions No. 8, Author and Subject Index to the Publications on Plant Pathology Issued by the U. S. Department of Agriculture up to January 1, 1925, compiled by J. M. Allen — 846

Bibliographical Contributions No. 9, World Food Supply: A selected Bibliography, compiled by M. T. Olcott — 896

OFFICE OF EXPERIMENT STATIONS:

A Classified List of Projects Carried on by the Agricultural Experiment Stations, 1924–25, E. R. Flint — 798

Work and Expenditures of the Agricultural Experiment Stations, 1923, E. W. Allen, W. H. Beal, E. R. Flint, et al — 677, 686, 687, 696

CROPS AND MARKETS:

Volume 3—

No. 14, April 4, 1925 — 92
No. 15, April 11, 1925 — 92
No. 16, April 18, 1925 — 92
No. 17, April 25, 1925 — 92
No. 18, May 2, 1925 — 392
No. 19, May 9, 1925 — 392
No. 20, May 16, 1925 — 392
No. 21, May 23, 1925 — 392
No. 22, May 30, 1925 — 392
No. 23, June 6, 1925 — 491
No. 24, June 13, 1925 — 491
No. 25, June 20, 1925 — 491
No. 26, June 27, 1925 — 491

Volume 4—

No. 1, July 4, 1925 — 691
No. 2, July 11, 1925 — 691
No. 3, July 18, 1925 — 691
No. 4, July 25, 1925 — 691
No. 5, August 1, 1925 — 794
No. 6, August 8, 1925 — 794
No. 7, August 15, 1925 — 794
No. 8, August 22, 1925 — 794
No. 9, August 29, 1925 — 794

Volume 2—

Supplement 4, April, 1925 — 92
Supplement 5, May, 1925 — 392
Suuplement 6, June, 1925 — 488
Supplement 7, July, 1925 — 691
Supplement 8, August, 1925 — 794

BUREAU OF AGRICULTURAL ECONOMICS:

Agricultural Economics Bibliography—

No. 1, Agricultural Economics, compiled by M. G. Lacy — 288
No. 2, Flour Milling and Bread Making, compiled by C. L. Phillips and J. H. Shollenberger — 9
No. 3, A Beginning of a Bibliography of the Literature of Rural Life, compiled by M. G. Lacy — 297
No. 4, Price Spreads, compiled by L. O. Bercaw — 294
No. 5, Long-time Agricultural Programs in the United States—National, Regional, and State, compiled by M. G. Lacy — 493

Avoidable Losses in Cotton Handling — 293

	Page
BUREAU OF AGRICULTURAL ECONOMICS—Continued.	
Dry Farming in Western Kansas, E. O. Wooton	88
Grain Investigations [Publication] 31, Compilation Relating to Uses and Products Made of Corn, C. L. Phillips and E. G. Boerner	614
Grain Investigations [Publication] 33, A Simple Test for Determining the Oil Content of Flaxseed, D. A. Coleman and H. C. Fellows	611
Living Conditions and Family Living in Farm Homes of Schoharie County, New York, E. L. Kirkpatrick and J. A. Dickey	692
Service and Regulatory Announcements No. 94, Official Standards of the United States for American Cotton Linters	634
Taxation of Rented Farms, 1919, C. O. Brannen and J. T. Sanders	90
BUREAU OF ANIMAL INDUSTRY:	
Order 292, Regulations Governing the Interstate Movement of Livestock	667
BUREAU OF HOME ECONOMICS:	
Selected List of Government Publications on Foods and Nutrition (revised, 1925), compiled by R. Van Deman	260
Selected List of Government Publications on Textiles and Clothing, compiled by R. Van Deman	299
BUREAU OF PUBLIC ROADS:	
Public Roads, vol. 6—	
No. 1, March, 1925	83, 84
No. 2, April, 1925	284
No. 3, May, 1925	483
No. 4, June, 1925	483
No. 5, July, 1925	683, 684
No. 6, August, 1925	789, 790
BUREAU OF SOILS:	
Field Operations, 1921—	
Soil Survey in Arkansas, Lonoke County	616
Soil Survey in California, Eureka Area	16
Soil Survey in Iowa, Benton County	416
Soil Survey in Iowa, Des Moines County	416
Soil Survey in Iowa, Grundy County	212
Soil Survey in Iowa, Jasper County	416
Soil Survey in Maryland, Allegany County	417
Soil Survey in Maryland, Wicomico County	417
Soil Survey in Nebraska, Boone County	212
Soil Survey in North Dakota, McHenry County	417
Soil Survey in Pennsylvania, Green County	616
Soil Survey in West Virginia, Tucker County	814
Field Operations, 1922—	
Soil Survey in Iowa, Delaware County	616
Soil Survey in Tennessee, Henry County	814
WEATHER BUREAU:	
Monthly Weather Review, vol. 53—	
No. 1, January, 1925	210, 211
No. 2, February, 1925	210, 211
No. 3, March, 1925	508
No. 4, April, 1925	508, 719
No. 5, May, 1925	718, 719
No. 6, June, 1925	718

WEATHER BUREAU—Continued.
Climatological Data—
Volume 11—
Page
No. 13, 1924 211
Volume 12—
Nos. 1–2, January–February, 1925 211
Nos. 3–4, March–April, 1925 509
Nos. 5–6, May–June, 1925 719
Daily River Stages—
Volume 21, 1923 83
Volume 22, 1924 788

EXPERIMENT STATION RECORD

VOL. 53 JULY, 1925 No. 1

One of the most promising developments since the passage of the Purnell Act has been the renewed interest in cooperation in research which the new legislation seems to have awakened. At the St. Louis conference of administrative officials for the formulation of plans the cooperative spirit was strongly in evidence, both as regards cooperation between the stations themselves and between the stations and the Federal Department of Agriculture. There was a widespread endorsement of Secretary Jardine's remark that "cooperation is good for research people as well as for farmers," and many indications of a deepening conviction that this state of mind should be crystallized into concrete and constructive action as speedily as possible.

Reference has already been made in these columns to the selection by the conference of six comprehensive problems of national scope in which it was believed that the stations and the Department might well cooperate, and to the subsequent appointment by the Association of Land-Grant Colleges of special committees to outline these problems as a preliminary to inviting participation in such phases of them as individual stations and bureaus might desire. Early in June five of these committees, composed of members of the stations and the Bureaus of Agricultural Economics, Home Economics, and Dairying, met in Washington, canvassed their respective problems, and prepared outlines. Immediately thereafter the joint committee of the association and the Department on projects and correlation of research assembled, received the reports, and eventually, after discussion with the committees, approved the outlines as a basis for projects to be undertaken by cooperative effort. The outlines were then transmitted to station directors and heads of bureaus in the expectation that each station would select whatever problems or phases thereof it might desire to engage in, having regard to its local conditions and such matters as funds, personnel, and special facilities. The projects when selected were then to be submitted to the Office of Experiment Stations in the usual way.

The sixth committee did not meet in Washington, but was scheduled to assemble in Kansas City June 15 to consider the problem of the factors which influence the quality and palatability of meat. This is a cooperative project upon which considerable work has already been done, including a study by a committee of the American Society of Animal Production. At the 1924 meeting of this society the project was formally approved, and it has also received the endorsement of the National Livestock and Meat Board. It was expected that the findings of the committee, when available, would be transmitted directly to those stations interested in the undertaking.

The five problems referred to the committees meeting in Washington dealt with the distribution and marketing of farm products, the problem of surpluses of farm products, the vitamin content of food in relation to human nutrition, rural home management studies, and rural social organizations and agencies essential to a permanent and efficient agriculture. Action on one of these, the problem of surpluses, was deferred until a later date, a subcommittee being appointed to examine the question in detail. For all the others outlines were prepared and distributed.

The committee on the problem of the distribution and marketing of farm products submitted an extensive program. It believed that for the present the greatest advantage would lie in the development of research along three main lines, the problem of marketing and distributing livestock and its products, cotton, grain, fruits and vegetables, and dairy products; studies of cooperative marketing associations; and studies of the requirements of consumer areas. For livestock alone fourteen subjects of inquiry were suggested, of which those recommended as of more immediate importance deal with seasonal movement to market, channels of marketing, business organization and the management of individual marketing agencies, prices, market requirements as a factor in the selection of a market, trends of production and consumption, forecasts, and adjustments. For most of these the cooperation of the Department and the stations was advocated.

As regards the marketing of cotton, two cooperative projects were considered for early action. One of these would deal with studies of equipment and ginning practices and the other with local marketing practices. It was pointed out that in such studies cooperation would be a most effective line of attack, since the participation of a number of cotton-producing States would extend the scope of the studies and give to the findings a regional rather than a more or less localized significance. Likewise it was thought that the Bureau of Agricultural Economics might render assistance not

otherwise obtainable through its facilities for the expert grading of samples and in similar ways.

In the marketing of fruits and vegetables, the committee saw a special opportunity for cooperative effort between States having within their borders large consuming centers and those which send vast quantities of produce to distant markets. Here again it was thought that the Bureau of Agricultural Economics might be of much assistance, both because of the very considerable amount of information which it has already assembled and because of its unique position as an inspection and statistical agency in the larger markets. Somewhat the same considerations also apply in the studies of the marketing of grain and in lesser degree to work with dairy products.

The committee on the vitamin content of food in relation to human nutrition reported that there are two phases of the vitamin problem upon which cooperative work can well be centered. These are, first, the vitamin content of foods as affected by methods of production, and, second, the influence of methods of handling on the vitamin content. These two phases were selected because the methods of work can be stated with sufficient definiteness to be comparable from one institution to another, because of the need of this information in the field of practical dietetics, and because the stations are in a particularly strategic condition to conduct these experiments. The committee also made suggestions for the application of our knowledge of vitamins in practical dietetics through cooperation with agencies at the stations prepared to handle such studies and with the information made available through extension agencies.

A comprehensive outline for experimental work was mapped out which indicates the breadth of the vitamin problem as at present visualized. Thus, as regards foods of plant origin, the influence of soil and fertilizers, combined climatic factors, light, stage of maturity, and rapidity of growth, and for foods of animal origin, the influence of feeding, age and physiological condition of the animal, breed and individuality, and environment are phases any one of which would form the basis of one or more projects well deserving of study. Likewise, under methods of handling foods as affecting the vitamin content, the conditions of transportation and storage, milling, and other treatment during manufacture, and methods of preservation and of preparation for the table suggest lines of inquiry so comprehensive as to require long periods of time for their complete solution if attacked in an isolated and fragmentary way.

The committee on rural home management studies reported that the two major problems which face the farm home maker are the

management of time and energy and the management of income. The first of these fields includes such problems as the efficiency of the household plant and the methods of housework; community agencies such as laundries, creameries, and bakeries as means of reducing the time, energy, and money costs of the farm household; the extra household tasks of the farm woman; and the economic value of the farm home maker's work. The second field has to do with such matters as the consumption habits of farm families in regard to food, clothing, furnishings, recreation, and other items from the standpoint of adequacy and economy; the purchasing habits and facilities of farm families; the factors influencing consumption, such as advertising, fashion and price variations; the cash contribution of the farm woman to the family income; and family budgeting and accounting methods. As national projects the committee has chosen from this list three studies, the present use of time by farm home makers, efficiency studies of the household plant, and a study of the food expenditures of farm families.

The fifth committee, that on rural social organizations and agencies essential to a permanent and efficient agriculture, reported that it conceives the field of investigation in rural social organization as the study of those rural institutions, organizations, and relationships whose progressive adaptation and integration make possible the maintenance of an adequate rural life. The committee recognized the importance of several lines of research already inaugurated by different stations in cooperation with the U. S. Department of Agriculture, among them those phases of the standard of living which relate to community institutions and services and the study of rural municipalities, and commended their further development and support. As new projects it suggested studies of young people's organizations as a factor in rural life; factors influencing the effective location of rural groups in relation to topography, geography, lines and channels of transportation and communication, and economic and social services; and the composition and changes of the rural population.

With the dissemination of the problem outlines, the initiative for cooperative research passes to the individual institutions, and upon their response the fate of the movement must ultimately depend. Necessarily, the outcome will be influenced considerably by the local conditions. Not all of the stations will find the suggestions of equal applicability, and many of their programs will doubtless be built largely around projects in continuation or extension of work already under way or for which there is an immediate and outstanding demand and need. In such instances cooperative enterprises will make

but little appeal, and in others difficulties of one sort or another will doubtless arise which will at least defer participation.

None the less, conditions as a whole seem unusually auspicious for a practical test of cooperation in agricultural research on a larger scale and under sunnier skies than ever before. The advent of the Purnell funds, broadly available; the intensified interest in the large national aspects of agricultural questions; the growing realization of the need of more cooperation and coordination in scientific work if the most effective service is to be rendered; and above all the increasingly friendly attitude of scientists themselves toward working together—these are hopeful manifestations of an environment which should be more congenial for cooperation in research than has obtained on any previous occasion. The work of the various committees in putting into concrete form the most feasible suggestions that have been forthcoming has been a further great stimulus, and the committees are entitled to much credit for their constructive service.

The attitude of the Department of Agriculture toward increased cooperation may be inferred from the address of Secretary Jardine at St. Louis, in which he said, in part:

"It is a reasonable expectation that the Purnell Act will lead to a considerable enlargement of the cooperative relations between stations and with the various bureaus of the Department. This seems important at the present juncture. It is in line with the idea of organizing investigation around problems instead of around a single station department. Very many of the problems we now face are too large for individual States acting separately. They are regional or even national, and there is danger of viewing them too narrowly. . . .

"There is already a large and constantly increasing amount of cooperation between different bureaus of the Department and the stations in investigations of various kinds. It is believed that such cooperation will be even more desirable in the relatively new fields of agricultural economics, rural sociology, and home economics. Not only are the problems in these fields of wide range but the available workers are relatively few, so that the utmost use should be made of them. A given station may have an investigator preeminently qualified to study some problem of regional or even national significance. He should be permitted to take the leadership in the study of this problem, and it will be well if he can have the aid of investigations in other States or in the Department. Conversely, the Department may be so situated that it can best take the leadership in certain studies, and it will be equally well for it to have the aid of stations in such work. Sometimes groups of station investigators can best deal with a problem under a cooperative arrangement, in which the Department may or may not take a part. Whatever the

arrangement, there must be a spirit of give-and-take between research people and due recognition of contributions made by the cooperating parties. These funds were made available for the specific purpose of aiding agriculture, and we must not permit selfish personal considerations or petty jealousies in any way to jeopardize the results of our work.

"In these newer fields, then, there is a large place for cooperative effort: but this should be organized on a strictly cooperative basis. It should be arranged and carried out in accordance with carefully considered and matured plans, under which both the individual stations and the appropriate branches of the Department will limit their endeavors to comparatively few well chosen projects, into which they can put their best qualified workers and sufficient money to give reasonable assurance of useful results."

It thus appears that in this and in many other ways the ground is well prepared for the new venture. How far the stations will embrace the opportunity and what measure of success will attend their efforts remain to be determined, but if a considerable number of institutions make the attempt it will be a long step forward. For many years much has been said of the advantages of cooperation and much has been accomplished in a practical way, but no such general participation in a cooperative program has hitherto been obtainable. Developments in the months to come will therefore be awaited with keen interest and widespread hopes.

Attention has been called to the fact that the fields of investigation which seem likely to receive special attention under the new conditions, those of agricultural economics, rural sociology, and home economics, are also among the newer branches of learning, and it has been suggested that a limiting factor to rapid development at this time may be a relatively low proportion of adequately trained specialists in these subjects. Such a condition, if it existed, would be substantially what has been encountered in greater or lesser degree in other sciences in their pioneer stages, and would be in no sense an implication of lower standards or failure to appreciate the desirability of advanced study. In a new field, with the harvest plentiful and the laborers few, various circumstances may militate for a time against graduate work. Courses are less readily available; leaves of absence may be less conveniently arranged; opportunities for immediate service are often more numerous and attractive.

The recent appearance of another edition of the list of workers in agriculture and home economics in the agricultural colleges and experiment stations which is issued annually by the Office of Experiment Stations, has offered an opportunity to discover in some degree how far this condition actually obtains. The results of com-

putations which have been made are more or less surprising. For the entire group of college and experiment station personnel, exclusive of extension workers, 542 have received the doctor's degree or its equivalent, 800 the master's degree, 653 only the bachelor's degree, and 151 are credited with no degree. For the college and station workers in agricultural economics and rural sociology the corresponding numbers are 53, 93, 49, and 5, while for home economics the figures are 12, 151, 216, and 40.

For those members of the staffs with rank above that of instructor, the showing is even more striking. In agricultural economics and rural sociology there are only 20 persons in the upper grades without advanced degrees, 69 having the master's degree and 53 the doctor's degree. In home economics there are 16 without college degrees, mainly teachers of domestic art, 89 with only the bachelor's degree, 117 with the master's degree, and 12 with the doctor's degree.

This showing clearly indicates the large extent to which advanced training has been sought and obtained by workers in agricultural economics and rural sociology. When it is recalled that the 1910 session of the Graduate School of Agriculture was the meeting place for the initial round-table discussion of the field of teaching and investigation in farm management, agricultural economics, and rural sociology, there appears to have been rapid progress indeed.

For home economics the data are somewhat less favorable, yet in the grades above that of instructor the majority have attained at least the master's degree. Quite certainly this is a much more impressive showing than would have been possible even five years ago, and the likelihood of greatly increased opportunity to undertake research in this field will doubtless prove a stimulus to additional training in the near future. It is also probable that many investigators on home economics problems will be attracted whose training has been in other lines, notably biological chemistry, bacteriology, and other fundamental sciences.

On the whole, while the data are by no means conclusive, they are at least reassuring. This is particularly true when it is recalled that the recent commencement season has doubtless considerably increased the ranks of holders of advanced degrees. Evidently there need be little apprehension of serious difficulty in recruiting an adequate staff in any of these branches over any extended period if conditions are otherwise made reasonably attractive.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Catalysis.—The rôle of catalysis in analytical chemistry. II, Spec. part, 2. Sect., Biological catalyzers. I, Hydrolyzing enzymes, G. WOKER (*Die Katalyse. Die Rolle der Katalyse in der Analytischen Chemie. II. Spez. Teil, 2. Abt.: Biologische Katalysatoren. I. Hälfte: Hydrolysierende Fermente. Stuttgart: Ferdinand Enke, 1924, pp. XVI+583, figs. 5*).—This continuation of the work previously noted (E. S. R., 34, p. 312), of the series entitled Die Chemische Analyse, edited by B. M. Margosches, contains a general section on catalysis through enzyme action, which includes a discussion of the similarity between the relationship of bacteria to toxins and of enzymes to the products of hydrolysis which they bring about. The hydrolyzing enzymes are then discussed under the general heading of saccharifying and proteolytic enzymes.

The chemistry of the strength of wheat flour, P. HALTON (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 587–599, figs. 3*).—This paper reports a continuation of an investigation begun by Woodman (E. S. R., 49, p. 308).

The gliadin and glutenin were extracted from six different flours and examined by the racemization method. The extraction was conducted by a slightly different technique from that usually employed. Instead of relying entirely upon exhaustive extraction with 70 per cent alcohol, the gluten obtained by the usual kneading process under water was extracted several times with 70 per cent alcohol, squeezed to free it from as much alcohol as possible, and then stirred into 0.2 per cent potassium hydroxide solution, from which it was precipitated in a finely divided state by neutralization with normal hydrochloric acid. After decantation of the supernatant liquid, the protein was stirred into 70 per cent alcohol, and the process of solution in alkali, precipitation with acid, and extraction with alcohol was repeated several times.

The racemization curves of the gliadin samples were practically identical, while those of the glutenin showed marked differences, thus substantiating Woodman's results. The specific rotations of the glutenin samples were also found to vary according to the strength of the flour.

An alkaline solution of the glutenin from one of the flour samples was divided into two lots, each of which was treated with normal hydrochloric acid, drop by drop with stirring, until a point was reached at which the protein separated out in a flocculent state. On adding the hydrochloric acid as before to the clear supernatant liquid, a second flocculation occurred. The difference between the two corresponded to the addition of 3.8 cc. of normal hydrochloric acid per liter of solution. The two samples were found to have approximately the same nitrogen content, 17.38 and 17.42 per cent, but to differ appreciably in optical rotation. This is thought to indicate that glutenin is not a single protein, but consists of at least two proteins differing in their optical rotation. From the nature of the flour used and the proportion of the fractions of high and low specific rotation obtained, the conclusion is drawn that strength is associated with a glutenin of high specific rotation and weakness with a glutenin of low specific rotation.

Flour milling and bread making, compiled by C. L. PHILLIPS and J. H. SHOLLENBERGER (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 2 (1925), pp. [2]+24*).—This bibliography lists 81 books, 164 bulletins and pamphlets, and 12 milling journals dealing with modern scientific and technical phases of flour milling and bread making, and 8 mimeographed pamphlets containing abstracts of reports of investigations concerned with the handling, milling, and storage of grain.

Spices; seeds, herbs, leaves, etc.; botanical drugs, J. K. JANK (*New York: Spice Mill Pub. Co., 1924, 4. ed., rev., pp. 181, figs. 2*).—This is the fourth edition of this reference book on spices, the first edition of which has been noted previously (E. S. R., 34, p. 166).

Constituents of crude cottonseed oil, G. S. JAMIESON and W. F. BAUGHMAN (*Jour. Oil and Fat Indus., 1 (1924), No. 1, pp. 30–34*).—In continuation of an investigation of the constituents of crude cottonseed oil[1] the settlings were found to contain, "in addition to the constituents previously reported, a lecithin type of phosphatide which gives an ether-soluble compound with cadmium chloride. This phosphatide can only be partially removed from the oil by extraction with alcohol. It has been found in the 'settlings' from this oil. The treatment of the oil with water causes only a partial separation of this phosphatide. The phosphatides, resins, and presumably other substances present in small quantities in the crude oil have emulsifying properties, and are undoubtedly the cause in part for the retention of oil in the soap stock when the oil is refined by caustic soda."

Influence of temperature on optimum hydrogen-ion concentration for the diastatic activity of malt, A. G. OLSEN and M. S. FINE (*Cereal Chem., 1 (1924), No. 5, pp. 215–221, figs. 2*).—Attention is called to the different values reported in the literature for the optimum pH of malt diastase, and data are presented indicating that these differences are due to the temperatures employed.

Under identical conditions, except for varying temperatures, the optimum H-ion concentration for malt diastase varied from pH 4.3 to 6 as the temperature was raised from 25 to 69° C. As judged by the limited amount of data reported the optimum pH is a linear function of the temperature agreeing with the straight line equation

$$t_1-t_2=m(p_2-p_1)$$

where t_1 and t_2 are reaction temperatures and p_1 and p_2 the corresponding optimum pH values.

The synthesis of vitamin C by germination, E. M. HONEYWELL and H. STEENBOCK (*Amer. Jour. Physiol., 70 (1924), No. 2, pp. 322–332, figs. 3*).—The literature on the development of vitamin C in seeds on germination is reviewed, and experimental data are reported on attempts to determine whether the entire process of germination is necessary for this synthesis. Barley was used for the experiments and was fed dry, soaked for 24 hours, soaked for the same length of time and germinated in the dark for 3 days, and soaked for 96 hours, respectively. To each 100 gm. of dry barley or its equivalent was added a mixture of dried alfalfa 19, casein 6.35, sodium chloride 0.63, and calcium carbonate 1.27 gm. Accurate records were made of the food consumed, and the guinea pigs were weighed every 2 or 3 days and examined carefully for symptoms of scurvy, which were confirmed by post-mortem examination.

In the two animals fed dry barley there was a rapid loss of weight, and death from scurvy followed in 19 and 22 days, respectively. On soaked barley

[1] Cotton Oil Press, 6 (1922), No. 4, pp. 33–35; 7 (1923), Nos. 2, pp. 35, 36; 5, pp. 29, 30.

the loss in weight and symptoms of scurvy were somewhat slower in appearance, and death occurred in 28 and 30 days, respectively. The animals on germinated barley grew and showed no signs of scurvy. On barley soaked for 96 hours the loss in weight began about the sixteenth day, and death from scurvy occurred in about 37 days.

It is concluded that vitamin C is not synthesized to any appreciable degree during the soaking period of the seeds, but in considerable amounts during germination even in the dark, thus showing that the vitamin, although easily destroyed by oxygen, requires oxygen for its synthesis by the germinating seed.

Attempts at the identification of the factor A.—The factor A and phytol [trans. title], M. Javillier, P. Baude, and S. Levy-Lajeunesse (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 19, pp. 998–1000*).—In order to determine whether any chemical relationship exists between vitamin A and chlorophyll, the authors have tested phytol as a source of this vitamin and found it to be entirely inactive in the relatively large dosage of 0.01 gm. per day per 100 gm. body weight of the experimental rats. In connection with this study, the acetone and alcohol extracts of nettle leaves were found to furnish sufficient vitamin A in curative experiments when fed in doses equivalent to 0.3 per cent of the ration. The unsaponifiable fraction in doses of 0.07 per cent of the ration was equally effective.

The micro determination of urea and of ammonium salts by titration of the hypobromite [trans. title], B. Pohorecka-Lelesz (*Bul. Soc. Chim. Biol., 6 (1924), No. 8, pp. 773–787*).—The author reports that the iodometric and alkalimetric methods of determining urea by the decomposition of alkaline hypobromite can be adapted to accurate micro analysis under certain conditions. The micro determination of the oxygen of the hypobromite was found to give accurate results in the cold, but for the alkalimetric determination it was necessary to use heat in order to diminish the loss of sodium through a nonbromine compound which is formed more easily in the cold than the hot.

It was also found that the iodometric determination of ammonia by means of alkaline hypobromite could be applied to the micro determination of ammonium sulfate formed in the Kjeldahl method. In this determination the previously neutralized sulfuric acid is titrated in the original flask without distillation.

A new method for the determination of ammoniacal nitrogen in soils, W. McLean and G. W. Robinson (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 548–554*).—On account of the difficulty in using the Matthews aeration method for the determination of ammoniacal nitrogen in soils (E. S. R., 43, p. 211) in laboratories with poor water pressure, a study was made of the Hissink leaching method (E. S. R., 50, p. 16). The procedure adopted as a result of the study is essentially the same as the original Hissink method, with the exception that the leaching process is conducted in the cold and magnesium oxide is used in place of sodium hydroxide for the distillation of the ammonia. In a study of the effect of certain variations in the working conditions, it was found by comparison with the aeration method that recovery was practically complete in the first 500-cc. leaching with normal sodium chloride except when unusually large amounts of ammoniacal nitrogen were involved. Under such conditions a second leaching is recommended or a more concentrated (15 per cent) solution for the single leaching.

Determinations of the amount of added ammonia recovered and of the results obtained with different soils by the aeration and leaching methods showed good agreement. The method is recommended for small laboratories with

limited resources on account of being economical of apparatus and water supply.

The determination of ammonia in soils, H. J. HARPER (*Soil Sci., 18 (1924), No. 5, pp. 409–418, fig. 1*).—In this investigation of various methods of determining ammonia in soils, a comparison was first made of the hydroxyl-ion concentration of the various compounds which have been used to liberate ammonia from ammonium salts, the determination being made electrometrically on solutions or suspensions of the compounds in the strength used in the various methods. Each of the compounds was then added to a 400-cc. portion of a solution containing 10 cc. of N/50 ammonium sulfate, and the distillation conducted until the evolution of ammonia was complete as determined by nesslerization of portions of the distillate. It was found that with $Ca(OH)_2$, K_2CO_3, and Na_2CO_3 all of the ammonia came over in the first 100 cc. of the distillate, while with MgO it was necessary to distill from 125 to 150 cc., with $MgCO_3$ from 175 to 200 cc., and with $CaCO_3$ or $BaCO_3$ from 300 to 350 cc.

The same compounds were then added in 1-gm. amounts to 500-cc. portions of ammonia-free water containing 100 mg. of one of a number of compounds containing amide nitrogen such as acetamide, asparagine, etc., and the mixture heated at various temperatures. The amide nitrogen was set free very slowly at 100° C. when the pH value of the solution was 10 or less and very rapidly at pH values above 10.5. At 42° under reduced pressure the amide nitrogen was not set free in solutions of pH 11.5 or less, while slow decomposition took place in solutions above pH 12. On aeration at room temperature very little decomposition of the amide group took place with basic compounds having pH values of 11.5 or less.

A comparison of these results with the pH values of the various compounds has led to the conclusion that on distillation with $MgCO_3$ (pH 10) or aeration with K_2CO_3 or Na_2CO_3 (pH 11.5) the ammonia can be liberated from soil extracts without decomposition of organic nitrogenous matter.

A comparison of the value of various salt solutions used to extract the ammonia from soils showed potassium chloride to be the best compound for the purpose. Extraction with 20 per cent potassium chloride gave practically the same amount of ammonia as aeration of a cold soil suspension containing 4 per cent potassium carbonate and 20 per cent potassium chloride. Based on these observations, a method of determining ammonia in soil has been evolved which is said to give satisfactory results both on field soils and in ammonification experiments. In the procedure adopted strong potassium chloride (a 10 or 20 per cent solution) is used for the extraction and magnesium oxide for the distillation.

During the course of the investigation it was found that ammonia added to a soil in the form of ammonium hydroxide was more difficult to recover than when added in the form of ammonium sulfate. On this account it is considered necessary in testing the efficiency of a method of determining ammonia in soils to add the ammonia as ammonium hydroxide instead of as ammonium sulfate.

Notes on a method for the determination of sulfur in soil, M. I. WOLKOFF (*Soil Sci., 18 (1924), No. 5, pp. 371–377*).—The method described, which is said to have been in successful use for three years at the Illinois Experiment Station, is a modification of the Olson method (E. S. R., 37, p. 614). The principal changes in the procedure consist in the use of a larger sample (3 gm. of soil or from 0.5 to 1.5 gm. of peat or muck), the less expensive Parr heat ignition bomb instead of the Parr electric bomb, and magnesium oxide as the accelerating agent in place of the mixture of boric acid, sodium nitrate,

and metallic magnesium. Only one dehydration of the silica is required, and the neutralization with ammonium hydroxide is omitted. The sulfur content of the reagents should be determined and deducted from that of the soil.

The technique of the method is described, and experimental data are reported in justification of the change in technique.

On the measurement of hydrion concentration in some dairy products by means of Biilmann's quinhydrone electrode, V. LESTER (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 634–641, figs. 3*).—The H-ion concentration of 10 samples each of whole milk, cream, and whey was determined with the quinhydrone electrode and also with the hydrogen electrode in the Höber-Hasselbalch electrode vessel with three electrodes.

The pH values according to the two methods generally differed by less than 0.05, although with each material a difference as great as 0.1 was obtained. In conducting similar determinations on buttermilk, it was found necessary to provide a stirring arrangement for the quinhydrone electrode to prevent the casein clots from sticking to the electrodes. With the use of this modified apparatus, which is described and illustrated, constant values were obtained. The minimum and maximum pH values obtained for each material by the quinhydrone electrode were as follows: Whole milk 6.61 and 6.67, cream 6.48 and 6.62, whey 5.53 and 6.02, and buttermilk 4.46 and 4.78, respectively.

To determine whether there is any difference in the buffer action of fresh and boiled milk, titrations with the quinhydrone electrode were conducted on fresh and boiled milk to which varying amounts of lactic acid had been added. In one series the volume was kept constant and in the other was increased. The results in both cases corresponded closely, indicating that there is no difference in the reaction or the buffer action of fresh and heated milk.

The quinhydrone electrode is recommended in place of the hydrogen electrode for determinations on milk on account of its rapidity and accuracy.

A modification of the Kramer-Tisdall method for the determination of sodium in blood serum, R. L. HADEN (*Jour. Lab. and Clin. Med., 10 (1924), No. 3, pp. 236, 237*).—This modification of the Kramer-Tisdall method (E. S. R., 45, p. 716) consists essentially in the use of the centrifuge instead of the Gooch crucible for separating the precipitate. The precipitation is made on 1-cc. samples of blood serum or plasma in ordinary high form No. 0 weighed porcelain crucibles which fit closely into the 50-cc. cups of an International centrifuge. After centrifuging, the liquid is removed by decantation and the precipitate washed twice with 30 per cent alcohol, centrifuging after each washing. The crucibles are finally placed in an oven at 110° C. for an hour, cooled in a desiccator, and weighed.

A modification of the Bloor method for blood phosphates, K. L. McCLUSKEY (*Jour. Lab. and Clin. Med., 10 (1924), No. 2, pp. 143–149*).—The method described is a combination of the Briggs modification of the Bell-Doisy method for inorganic and acid-soluble phosphoric acid (E. S. R., 48, p. 111) and the Bloor method for total and lecithin phosphorus (E. S. R., 40, p. 16). The latter method was followed for the preparation and digestion of the blood samples. The determinations of total phosphorus, lecithin, and acid-soluble and inorganic phosphorus were made upon whole blood and plasma. For the acid-soluble and inorganic phosphorus determinations the deproteinization of the blood was carried out in some cases with acid ammonium sulfate and in others with trichloracetic acid.

It is noted in an addendum that the procedure described is similar to one recently reported by Briggs (E. S. R., 51, p. 612).

A method for the determination of lipoid phosphorus in blood and plasma, J. C. WHITEHORN (*Jour. Biol. Chem., 62 (1924), No. 1, pp. 133–138*).—

Attention is called to certain errors in the Randles-Knudson modification of the Bell-Doisy method of determining lipoid phosphorus (E. S. R., 48, p. 110). These consist in negative errors due to local overheating in the digestion process and positive errors due to reduction in acidity through volatilization of some of the sulfuric acid in the vigorous digestion. To overcome these errors, the author suggests the use of an amount of sulfuric acid sufficient to fill the hemispherical end of the test tube. This prevents local overheating and reduces the relative amount of acid volatilized during digestion. On account of the strength of the acidity, the blue color developing on the addition of acid molybdate, sodium sulfite, and hydroquinone appears after 10 minutes in boiling water. The intensity of the color on cooling is said to be proportional to the quantity of orthophosphoric acid even when the difference exceeds 33 per cent. The color increases slowly for about 24 hours and does not fade out completely for several weeks.

Reduction tables for blood sugar determinations according to the new method of Bang for weights of material from 50 to 130 mg. [trans. title], H. Dreyfuss (*Biochem. Ztschr., 150 (1924), No. 3–4, pp. 211–223*).—Tables are given of the titration difference in cubic centimeters of N/100 sodium thiosulfate, in steps of 0.01 cc., and corresponding percentages of blood sugar for various weights of the original material from 50 to 130 mg. in the Bang micro method for determining blood sugar.

Citrus pectin, H. D. Poore (*U. S. Dept. Agr. Bul. 1323 (1925), pp. 20*).—An investigation of various methods of preparing from citrus peel a suitable pectin free from bitterness is reported in considerable detail.

The method finally evolved consists essentially in a preliminary removal of some of the bitter matter and the color by soaking the finely ground peel overnight in cold water, the extraction of the pectin by heating the residue from the preliminary soaking at 98° C. with water containing 0.4 per cent citric acid, repeating the process, filtering through 2 per cent kieselguhr, evaporating on a steam bath in a current of air to a thick paste containing from 25 to 50 per cent of solids, adding a sufficient amount of 95 per cent alcohol containing 5 per cent benzol to take up the remaining water and form a granular mass, washing this with successive portions of 95 per cent alcohol, and drying the residue below 70°. From 8.6 kg. of finely divided peel from slightly green lemons, 192 gm. of pectin was obtained with the use of only 4,200 cc. of 95 per cent alcohol as compared with 5,500 cc. required for the direct precipitation of about one-tenth as much pectin. On a large scale a further improvement could be effected by conducting the evaporation in a vacuum pan or a revolving steam drum and by using a continuous counter current washing device.

Analyses by E. K. Nelson of apple, lemon, and orange pectins are reported. The data show no differences in chemical composition sufficient to distinguish between them chemically.

Data are also reported on the effect upon jellying of variations in the amount of acid, sugar, and citrus pectin. The jellying test employed throughout was based upon the following formula: Thirty-one gm. of sucrose is dissolved in 19 cc. of distilled water containing 0.25 gm. of citric acid, the solution brought to boiling, a known weight of pectin dissolved in 6 cc. of water is added to the contents of the beaker, and the solution boiled gently for a minute. The beaker is allowed to stand overnight, after which the character of the jelly is noted. The amounts of pectin are changed until the character of the jelly is satisfactory according to the Goldthwaite standard. If the rate of boiling and the quantity of water used are regulated so that the jelly weighs

50 gm., the weight of the pectin used divided by the weight of the jelly obtained gives the percentage of pectin required for a good jelly. In the present instance the lower limits in the proportions of acid, sugar, and pectin in the above formula giving satisfactory results are citric acid 0.045, pectin 0.2, and sucrose 37 per cent.

A bibliography of 61 titles is appended.

METEOROLOGY

Rain-grown cotton and climate, E. E. Canney (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 3 (1924), No. 24, pp. 281–290, pls. 2; also in Jour. Textile Inst., 15 (1924), No. 12, pp. T533–T542, pls. 2; abs. in Nature [London], 115 (1925), No. 2890, p. 438*).—For the purposes of this study certain meteorological limits for successful cotton growing are assumed as follows: "(1) A mean annual temperature over 60° F. or, where the distribution of rainfall, sunshine, and temperature is very favorable, over 50°; (2) a minimum rainfall of 20 in. per annum, given suitable seasonal distribution, and a maximum of 60 in., rising perhaps to 75 in. if favorably distributed; (3) areas recording 'half cloudiness' annually are assumed for the present to suffer from too little sunshine, and areas over 'three-fifths cloudiness' to be extremely unsuitable. . . .

"It does not appear that the limit of cloudiness beyond which cotton growing is hazardous has ever been defined," although adequate sunshine, especially during the maturing period, is considered a dominant factor worthy of as much consideration as water supply and warmth.

Three maps are given which show (1) areas unfavorable to cotton growing from one or more causes, (2) areas remaining after eliminating those with two inhibiting factors, and (3) regions over 3,000 ft. in elevation, for which altitude modifications must be made.

The most promising region for possible extension of the area of rain-grown cotton "would appear to be the Argentine-Uruguay-Paraguay-southern Brazil belt, which lies just about as far south of the Equator as the American lies north and enjoys a similar range of climate." The most promising regions within the British Empire "appear to be southern Sudan, Northern Nigeria, the valleys of the Limpopo and Zambezi, South Africa, and the 200-mile strip of coast on the east and north of Australia," provided the right type of cotton is found for each climatic zone within these regions.

The author concludes in general that there are probably sufficient areas under suitable climatic conditions to permit of twice the present acreage of rain-grown cotton. "With insect pests no more controllable than they now are, there is enough land with suitable climate awaiting development to grow as much cotton as will be required for many generations."

Numerous references to the literature of the subject are cited.

The influence of rainfall on the yield of wheat at Rothamsted, R. A. Fisher (*Roy. Soc. London Phil. Trans., Ser. B, 213 (1924), No. B404, pp. 89–142, figs. 10; abs. in Nature [London], 112 (1923), No. 2820 p. 745*).—Rothamsted data for rainfall and wheat yields, 1854–1918, are used to calculate the average effect of additional rainfall is harmful, that is, under Rothamsted conditions different fertilizer treatments.

It appears that the crop response to rain is intimately connected with soil fertility, predominantly the effect of excessive rain in removing nitrates. "This effect masks and overshadows all others." On all plats the average effect of additional rainfall is harmful, that is, under Rothamsted conditions

dry weather is generally beneficial. "In all the plats October is a month in which the average loss per inch of rain is small, or in which rain above the average is positively beneficial. This is the reverse of the condition found by Hooker, who finds the greatest negative correlation with rain early in October." Analysis of the rainfall data indicates that "the wet years tend to occur in spells; a continuous and progressive change is observable in the distribution of rain through the year; in other respects the sequence appears to be fortuitous. Rainfall changes account for only a portion of the slow changes observed in the yields."

The inherent difficulty, with methods and data now available, of elucidating the relationship of yields of crops to the weather conditions which largely control them is pointed out, and the difficulty is ascribed largely to "the problem of specifying the weather itself. Meteorologists have, however, gradually devised a number of instrumental observations, which, although far from specifying the total environment of the growing plant as understood by the plant physiologist, do nevertheless give a sufficiently detailed account of the general environmental conditions of the growing crop, in so far as these vary from season to season. It is probable indeed that almost all the weather influences to which crop variations are due could be expressed in terms of the instrumental observations of a modern meteorological station. The actual difficulty of calculating the crop variations from given instrumental records is, however, immense. . . . The complete aim of agricultural meteorology should, however, be emphasized, for it is only by its substantial achievement that other causes of crop variation can be freed from much obscurity."

A list of 17 references to literature bearing on the subject is given.

[Meteorological conditions in England, 1924] (*Nature [London], 115 (1925), No. 2880, pp. 59, 60*).—Greenwich observations, which are stated to "give approximately the average conditions over England," are briefly reviewed, showing that 1924 was generally wet, for the most part mild in winter and cold in summer, and deficient in sunshine. The mean temperature was 50.6° F., but 0.5° above the normal. The total rainfall was 31 in., 7.5 in. above the average for 35 years. "Records of temperature and rainfall for London now extend over about the last 200 years, but careful examination of these fails to give any cycle or periodicity which can help in the prognostication of the weather for a coming year or season."

The ecological rôle of winds [trans. title], D. SZYMKIEWICZ (*Acta Soc. Bot. Polon., 2 (1924), No. 2, pp. 130–151, figs. 3*).—Data for wind velocities in widely separated regions of the world are reviewed, especially with reference to the effect of wind on vegetation. It is shown that trees are especially subject to the injurious effect of wind, and that cold winds of an average velocity of 6 meters per second at 10 meters above the ground are fatal to all kinds of tree growth. Other climatic factors may determine the distribution of certain trees, but none of them has been found to be wholly destructive of tree growth.

Photosynthesis and the possible use of solar energy, H. A. SPOEHR (*Jour. Indus. and Engin. Chem., 14 (1922), No. 12, pp. 1142–1145; also in Smithsn. Inst. Ann. Rpt. 1922, pp. 175–185*).—The stated purpose of this article is to show that the only means we now have of utilizing solar energy is through the photosynthetic process of the plant, and that this is so inefficient and uncertain that it is exceedingly doubtful whether it can be depended upon to maintain our energy requirements. Cooperative study of means of utilizing solar energy is advocated. "The most promising outlook for success in this field would be offered through an organization by which information from the various allied fields can be collected and focused on the chemical and energy changes taking place in the process of photosynthesis."

SOILS—FERTILIZERS

The chemistry of crop production, T. B. Wood (*London: Univ. Tutorial Press, Ltd., 1924, 2. ed., pp. [4]+193, figs. 11*).—This is the second edition of this book (E. S. R., 45, p. 114), based on prices current in 1924.

Soil survey of the Eureka area, California, E. B. Watson et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+851–881, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 284,800 acres, including the largest areas of agricultural land in Humboldt County in northwestern California. The topography varies from mountainous to that of flood plains. In the mountainous part the drainage is well established, while the flood plains of the small streams and the low-lying lands on the river deltas are poorly drained.

The soils are said to be well leached of lime and other soluble minerals, and are prevailingly slightly to distinctly acid in reaction. They are grouped as residual soils, soils derived from coastal plain and old valley filling material, soils derived from wind laid materials, and recent alluvial soils. Including rough mountainous land; coastal beach, dunesand, and riverwash; and tidal marsh and swamp, 15 soil types of 9 series are mapped, of which rough mountainous land covers 41.9 per cent, and Empire fine sandy loam, the most extensive classified type, covers 17.1 per cent of the area.

The chemical composition of the soils of the Bernardsville area in New Jersey, A. W. Blair and A. L. Prince (*New Jersey Stas. Bul. 406 (1924), pp. 16, figs. 2*).—Supplementing the physical survey of the soils of the area made in cooperation with the U. S. D. A. Bureau of Soils and the State Department of Conservation and Development (E. S. R., 49, p. 720), chemical analyses of about 90 samples of representative soils of the area are presented and discussed.

These indicate that in many cases the top soils contain more than three times as much nitrogen as the subsoils and usually more phosphoric acid. The amount of potash in the subsoil is often as much as and sometimes more than that in the top soil. The majority of the soils of the area show an appreciable lime requirement.

The soil of abandoned plantations, K. Adinarayana Rao (*Jour. Madras Agr. Students' Union, 12 (1924), No. 6, pp. 193–198*).—In a contribution from the Agricultural Research Institute, Pusa, the results of an examination of the soil of certain abandoned coffee and tea plantations in India are briefly reported. These showed that all the bacteria essential to soil fertility are present in these soils in large numbers, but are not actively functioning under the highly acid conditions obtaining in the soil. Practically no lime was found. The addition of lime in sufficient quantities was found to improve all the biological activities of these soils to a considerable extent.

The theory of the mechanical analysis of sediments by means of the automatic balance, R. A. Fisher and S. Odén (*Roy. Soc. Edinb. Proc., 44 (1923–24), No. 2, pp. 98–115, fig. 1*).—A simplified mathematical statement of the theory of sedimentation through a stationary fluid is presented, which leads to the formula originally indicated by Odén, and shows that the characteristic distribution of the sediment may be obtained (1) from the variation of density with depth, (2) from the rate of change of density at a given depth, (3) from the variation of hydrostatic pressure with depth, and (4) from the rate of change of hydrostatic pressure at a given depth. Schloesing's sedimentation theory is considered to be incomplete and to lead to large errors in the interpretation of observations.

A discussion is given of the statistical problems arising in the reduction of sedimentation data derived from the automatic balance. Examples of such data from two duplicate experiments are utilized to reveal the experimental errors involved.

Two types of fluid motion appeared to influence the results. The first of these was a vertical circulation set up by the initial disturbance of the fluid, the theoretical effects of which agreed with errors indicated by the experiments as occurring during the first 100 minutes of sedimentation. This disturbance could be remedied by using fluids of higher viscosity, especially as this procedure increased the time taken by the coarser particles to settle, in addition to reducing the time necessary to obliterate the initial disturbance. In the second of these two types of fluid motion it was found that convection currents of unspecified type will become important in prolonged experiments where the finer particles are being studied. Great experimental refinement may be necessary to avoid these, and their effect should be much reduced by maintaining the temperature of the water as closely as possible to that corresponding to its maximum density.

Experiments with subsoiling, deep tilling, and subsoil dynamiting, R. S. SMITH (*Illinois Sta. Bul. 258 (1925), pp. 154–170, figs. 6*).—Data from deep plowing and subsoil dynamiting experiments in Illinois and other States are summarized, indicating that such tillage methods can not be expected to increase crop yields materially. Subsoiling, deep tilling, and dynamiting experiments conducted on gray silt loam and brown silt loam showed that such methods are not superior to ordinary or medium depth plowing. Soil moisture determinations made during two seasons on variously tilled plats of silt loam soil showed that none of the tillage treatments used increased the downward movement of moisture through the soil.

How deep should we plow? L. E. THATCHER (*Ohio Sta. Mo. Bul., 10 (1925), No. 1–2, pp. 3–6*).—Data from deep plowing experiments for corn and wheat in a 4-year rotation of corn, oats, wheat, and clover are briefly reported. These indicate that although plowing deeper than ordinary as a regular practice has not shown a profit in crop returns, an occasional deepening of the plow furrow may be very beneficial under certain circumstances. Apparently the least effective method in both experiments, as measured in crop yields, is that of deep tillage with the disk plow.

The water requirements of the sugar cane and the conservation of soil water in British Guiana, C. W. B. ARNOLD (*Planter and Sugar Manfr., 73 (1924), No. 7, pp. 128, 129*).—A brief summary of data on these two subjects is presented.

Direct measurement of water loss from vegetation without disturbing the normal structure of the soil, J. E. WEAVER and J. W. CRIST (*Ecology, 5 (1924), No. 2, pp. 153–170, pl. 1*).—In a contribution from the University of Nebraska a method is described which has been devised for determining the water losses from square-foot areas of native grassland and cultivated crops without disturbing the soil structure. It consists of excavating soil columns 1 sq. ft. in cross-sectional area and 3 ft. deep, and forcing galvanized iron cylinders over these tightly as they are formed. The columns are then smoothly cut off and the bottoms sealed to the cylinders, which after weighing, are replaced in trenches of appropriate width and depth, so that after refilling the interspaces between the cylinders in the trench the vegetation in the containers is completely surrounded by undisturbed grassland or a crop similar to that inclosed in the soil column. The containers are covered during rain, and water is added to the soil as needed for a 15-day period, after which

they are reweighed and the losses calculated. Direct losses from the soil and from soil covered with dead plants are determined by controlled soil columns.

Experiments conducted on the short grass plains of Colorado, in mixed prairie in north-central Kansas, and in true prairie in eastern Nebraska showed that sufficient water is afforded to furnish the mean annual precipitation in the several plant associations. Crop plants were found to give off more water than native vegetation.

The method is considered to be applicable to the solution of a number of important ecological-agronomic problems, including water requirement, capillary movement of soil moisture, and nonavailable water, all of which should be determined in the field with soil of an undisturbed structure.

Relation between the downward penetration of corn roots and water level in peat soil, G. R. B. Elliott (*Ecology, 5 (1924), No. 2, pp. 175–178, figs. 2*).—Studies conducted at the University of Minnesota on the subject are briefly reported. These showed that the downward penetration of corn roots was bounded by a zone sharply defined by the flattening out of the roots within it. This zone was not more than 3 in. in thickness and was not at or near the water table. Its underside, beyond which the roots did not penetrate, was approximately 18 in. above and parallel to the water table.

It is pointed out that while the relationship between the growth of roots and the water level in mineral soils is well known, this relationship in peat soil is not known. It is deemed natural to expect a zone above the actual water level which is inimical to root growth, and the height of which above the water will vary with the season, precipitation, soil texture, and other factors. It is considered remarkable, however, that such a zone should ever be so great as a foot and a half above the water. These results are considered to have a profound influence on the design of a drainage system to control the water level in a marsh.

Drying of soil as one of the natural factors in maintaining soil fertility, A. N. Lebedjantzev (*Soil Sci., 18 (1924), No. 6, pp. 419–447*).—In a contribution from the Shatiloff Agricultural Experiment Station, translated from the Russian by B. Trajkovich and J. S. Joffe of the New Jersey Experiment Stations, the results of studies conducted during the years 1915–1920 on the effect of drying on the maintenance of soil fertility are reported.

The results showed that air-drying of a soil at ordinary temperatures produced a large increase in the yielding capacity in pot experiments, the degree of which depended upon the preceding cultural conditions of the soil. The uncultivated soils and those in grass for many years were especially responsive to drying. Soils under continuous mechanical treatment responded less readily. Soils fertilized with stable manure or phosphates were more responsive than unfertilized soils. All other conditions being equal, the response of a soil to drying increased as the fertility decreased. Different plants reacted differently to drying of the soil. The greatest increase in yield was shown by meadow grasses, followed by field legumes, field grasses, and intertilled plants.

A positive influence of drying was evident only with cultivated soils reaching a 6 per cent moisture content and with uncultivated soils reaching 14 per cent. With smaller degrees of drying, there was not only no increase in fertility but in most cases a decrease. Repeated drying of a sample of soil with intermediate moistening was accompanied by a further increase in the yielding capacity, and the maximum fertility was attained with triple drying. The maximum effect of drying for deep black soil appeared to be in the layers from 20 to 40 cm. (7.87 to 15.75 in.) and from 40 to 60 cm. It was markedly less for surface soils and for the layer deeper than 60 cm.

During the process of drying important chemical changes took place in the soil, which were indicated by a large increase in the solubility of organic substances, enrichment of the soil in nitrogen and phosphorus, a large increase in ammonia nitrogen, a considerable increase in amide nitrogen, and a sharp decrease in microorganisms. As a consequence of these results the drying of a soil is considered the same as partial sterilization.

Of the four factors acting on the soil during drying, the increase in fertility was found to be dependent upon dehydration and temperature and the decrease in fertility on oxygen and light. Soil naturally dried out in the field appeared to be much more fertile in pot experiments than dried soil lying nearby.

The conclusion is drawn that the process of drying is a factor controlling the fertility of the soil to a large extent and as such must be an important factor in all processes tending to increase soil fertility, including methods of mechanical cultivation.

On the nature of the absorption of ammonia by soils, K. MIYAKE, M. SUGAWARA, and K. NAKAMURA (*Jour. Biochem., 3 (1924), No. 3, pp. 283–304*).—In a contribution from the Hokkaido Imperial University, Sapporo, Japan, studies on the nature of the absorption of ammonia by soil are reported.

The results showed that the absorption of ammonia from ammonium chloride by soil reached a maximum in about half an hour. The effect of time upon the absorption of ammonia was demonstrated by the equation for the ordinary time rate of the diffusion of liquids into absorbing substances. The absorption increased as the temperature decreased. From a solution of ammonium chloride by soils it was a physical absorption, and the replacement of the soil base in the solution was a secondary chemical reaction.

Soil temperature as influenced by altitude and slope exposure, F. SHREVE (*Ecology, 5 (1924), No. 2, pp. 128–136, figs. 6*).—Studies conducted at the Desert Laboratory, Tucson, Ariz., are reported which showed that insolation is of more importance than air temperature in determining the temperature of the soil. The temperature of the soil was found to decrease with increase in altitude, and was usually higher on slopes facing south than on slopes facing north. The difference between the vegetation of north and south slopes was found to be due to a group of conditions initiated by the differences in insolation and soil temperature existing on them. Maximum soil temperatures showed more difference than minimum temperatures with differences of either altitude or slope exposure. The difference between maxima on north and south slopes increased with increase of altitude.

It was found that nocturnal radiation from the bare soil of low altitudes may produce minima as low as those of high altitudes. In the hottest weeks the soil temperature difference on opposed slopes at higher elevations was increased and at lower elevations was decreased, when compared with weeks of moderate temperature. The temperature of the soil was found to be of less importance than the ratio of evaporation to soil moisture in determining the alternation of vegetation on opposed slopes at different altitudes. It appeared probable that the relative importance of soil temperature in connection with slope differences of vegetation increased greatly at high altitudes and latitudes.

A note on the protozoan fauna of the soils of the United States, R. V. ALLISON (*Soil Sci., 18 (1924), No. 5, pp. 339–352, fig. 1*).—In a contribution from the Rothamsted Experimental Station the results of an examination of a series of soil samples from widely divergent points in the United States are reported.

These showed a considerable uniformity in the distribution of the more important of the three protozoan subphyla, flagellates, ciliates, and rhizopoda. The range of type genera was found to be quite similar to that in English soils.

The results obtained from the quantitative studies of these samples are taken to indicate tentatively that a possible explanation of the difference in the conclusions arrived at by English and American investigators may be found in the difference in the extent of the protozoan fauna in the respective materials investigated. Thus the biological phenomena which follow the partial sterilization of the soil, and which have been so extensively studied by both groups of investigators, although admittedly similar in nature may have as their fundamental basis groups of organisms of quite diverse natures.

The methods now in use at the station in this connection are briefly described.

Fertilizer experiments with potatoes to compare whole with half applications of stable manure and corresponding additions of commercial fertilizers [trans. title], F. MACH (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 2, Wirtschaft.-Prakt., pp. 449–455*).—The results of three experiments are reported which showed that a decrease in the application of stable manure to potatoes was not accompanied by a decrease in yield as long as the deficiency in nutrient material was made up by adding suitable amounts of commercial fertilizers. Neither the carbon dioxide formation nor the increased bacterial numbers resulting from the addition of the full, required amounts of stable manure had any influence in increasing yields.

Displacement of stable manure by mineral nitrogenous fertilizers [trans. title], O. LEMMERMANN (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 2, Wirtschaft.-Prakt., pp. 456–460*).—For the purpose of strengthening the findings of Mach noted above, the author briefly summarizes work by himself and others bearing on the subject, indicating that sodium nitrate may frequently displace stable manure and that the carbon dioxide production from stable manure has little influence on crop yields.

The most favorable form of nitrogen for major crops [trans. title], G. TRUFFAUT and N. BEZSSONOFF (*Sci. Sol [Truffaut], 3 (1924), No. 1, pp. 3–19*).—In a series of studies with different nitrogenous fertilizers and mixtures thereof in a feebly alkaline soil, identical results as regards green crops were obtained with nitric and ammoniacal nitrogen, but the results as regards the production of dry matter were superior for the latter. Ammonium sulfate gave the best results as regards nitrogen recovery by crops. The addition of urea to ammonium sulfate improved the results obtained with the latter considerably. The superiority of a mixture of urea and ammoniacal nitrogen in complete fertilizers was also indicated.

Further experiments demonstrated the general superiority of mixtures of ammoniacal or nitric nitrogen and urea. The nitric nitrogen mixture gave the best results in acid soils, while in marled soils the ammoniacal nitrogen mixture was superior. In fact, soil reaction was found to have a strong influence on the selection of nitrogenous fertilizers. However, the use of mixtures containing urea was justified as much on acid soil as on marled soil. Mixtures of nitrogenous fertilizers generally gave better results under all circumstances than the individual fertilizers.

Period of toxicity of different nitrogenous fertilizers to wheat during early growth [trans. title], MAUME and DULAC (*Compt. Rend. Acad. Agr. France, 10 (1924), No. 13, pp. 442–448*).—Studies of the influence of the nature of the soil and the fertilizer and the period during which the fertilizer is in the soil on the toxicity of different nitrogenous fertilizers to wheat sprouts are reported. The soils used were a quartz sand, a normally porous soil, and a

garden soil rich in organic matter. The fertilizers included sodium nitrate, granulated and powdered ammonium sulfate, ammonium chloride, ammonium nitrate, ammonium carbonate, ammonium bicarbonate, urea, and galalith.

In the sand soil the mineral fertilizers were toxic in applications exceeding 30 kg. of nitrogen per hectare (26.7 lbs. per acre) at the time of planting, while the limit for organic fertilizers was 12 kg. of nitrogen. When applied 15 days before seeding the favorable influence of the smaller applications increased slightly, and the injurious effects of the large applications decreased slightly. On the other hand, the action of the fertilizers varied with the period of contact in the normal porous soil when applied at the time of seeding, there being a progressive decrease in their injurious influence. When applied 15 days before seeding in this soil, the results were similar to those observed 13 days after growth appeared when the fertilizers were applied at the time of seeding.

In the organic soil the action of the organic fertilizers was less marked than that of the mineral fertilizers, and the toxicity of the ammonium salts especially was diminished.

These results are taken to indicate that in the mutual adaptation of crop, soil, and fertilizer, there is a factor residing in the period of toxicity of certain fertilizers for young plants which can not be neglected. This factor depends upon the nature and concentration of the fertilizer, the nature of the soil, the time elapsing between the application of the fertilizer and seeding, and the nature of the crop.

Action exercised by alkaline chlorides on plants and soils [trans. title], C. DUPONT (*Ann. Sci. Agron. Franç. et Étrang., 41 (1924), No. 6, pp. 369–391*).—Laboratory studies of the action of the chlorides of sodium and calcium on wheat, flax, vetch, buckwheat, white lupines, and mustard on siliceous soil well supplied with organic matter are reported, the purpose being to determine the conditions governing the best use of these chlorides as fertilizers. A comparison was also made of the carbonate and the chloride of potassium on buckwheat in garden soil.

The results showed that the addition of chlorides to the soil increased the chlorine content of the crops, but this increase varied widely with different crops and there was no relation between the quantity of chlorine absorbed and its toxic action. When used on soils well supplied with alkalies, alkaline chlorides tended to decrease the alkalinity of the soluble part of crop ashes, but where the soils were deficient in potash, resulting in a reduced alkalinity of the crop ashes, the use of potassium chloride increased the alkalinity of the soluble ashes.

Studies of the influence of chlorides on the soil showed that the transformation of potassium chloride into calcium chloride in soil depended upon the absorbing power of the soil. It was almost complete in clay soils, but was feeble in siliceous soils deficient in colloidal elements. Sodium chloride underwent such transformation to a less extent than potassium chloride, indicating that the power of soils to absorb sodium is less than that for potassium.

Dissolved lime salts had little action on the absorption of potash. On the contrary, they retarded the absorption of sodium and consequently decreased the formation of calcium chloride at the expense of sodium chloride.

When sodium chloride and potassium chloride were applied to soil, as when sylvinite was used, the calcium chloride formed at the expense of the potassium chloride prevented the transformation of the sodium chloride and decreased lime losses.

Action of titanium on plant production [trans. title], E. BLANCK and F. ALTEN (*Jour. Landw., 72 (1924), No. 2, pp. 103–110*).—Experiments are briefly reported which showed in every case that titanium in the form of sodium titanate exercised no influence on plant production.

Inspection of commercial fertilizers, H. D. HASKINS, L. S. WALKER, and G. B. DALRYMPLE (*Massachusetts Sta. Control Ser. Bul. 29 (1924), pp. 31*).—This bulletin reports the guaranties and the results of actual analyses of 569 samples of fertilizer and fertilizing materials collected for inspection in Massachusetts during 1924.

Inspection of lime products used in agriculture, H. D. HASKINS, L. S. WALKER, and G. B. DALRYMPLE (*Massachusetts Sta. Control Ser. Bul. 30 (1924), pp. 6, fig. 1*).—Guaranties and actual analyses of 21 samples of agricultural lime and 2 samples of gypsum collected for inspection in Massachusetts during 1924 are reported.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1924, C. S. CATHCART (*New Jersey Stas. Bul. 405 (1924), pp. 37, fig. 1*).—Guaranties and actual analyses of 691 samples of fertilizers and fertilizer materials collected for inspection in New Jersey during the spring of 1924 are presented and discussed.

The world's production and consumption of chemical fertilizers (*Production et Consommation des Engrais Chimiques dans le Monde. Rome: Inst. Internatl. Agr., 1924, 3. ed., pp. VIII+266, pls. 99*).—This is the third edition of this publication (E. S. R., 31, p. 424). It deals with the production, consumption, and movement of chemical fertilizers in the different countries of the world for the years 1913 to 1922, inclusive.

AGRICULTURAL BOTANY

Factors influencing the rate of germination of the seed of Asparagus officinalis, H. A. BORTHWICK (*California Sta. Tech. Paper 18 (1925), pp. 17, figs. 2*).—The present work was done with seeds grown in the lower Sacramento Valley, no difference appearing in control tests between seed aged one year and that aged two years as regards normal germination. Normally from 2 to 6 weeks go by in asparagus culture before the plants appear above ground, though apparently no dormancy period is required by asparagus seed.

The optimum temperature for most rapid germination of untreated asparagus seed is between 25 and 30° C. (77 and 86° F.). Water intake by immersed seed rises with the temperature within the range 10 to 40°, the maximum absorption of seeds at any temperature being about 43 per cent of their dry weight. Laboratory and field tests show a material increase of germination rate by soaking, which at temperatures not over 40° may be extended to a period of 9 days without lowering germinability. In the laboratory tests, at 20 to 38°, seeds soaked for from 2 to 9 days showed an acceleration of germination as compared with those soaked for shorter periods. The most accelerating temperatures were 25 to 35°. For practical purposes a period of from 3 to 5 days' soaking at a temperature of 30 to 35° is recommended as easy to apply, simple, and safe.

Growth stimulation and pest and disease control by hot-water treatment of sugar cane "seed," I–III, E. W. BRANDES and P. J. KLAPHAAK (*La. Planter, 71 (1923), Nos. 19, pp. 371, 372; 20, pp. 392–394, figs. 4; 21, p. 412*).—In studies carrying on until the summer of 1923 experimentation begun in 1920, hot-water treatment of dormant seed cane at temperatures below the killing point of the buds killed all borers and nearly all bugs present and hastened germination. Preheating for 15 minutes at 46° C. (114.8° F.), then heating

for 10 minutes at 50.7°, killed all insects but no buds, even the tender sprouted eyes surviving the treatment. Apparatus is described for maintaining constant temperatures uniformly throughout the bath during field treatments.

Hot-water treatment of dormant and sprouted seed cane, P. A. Yoder (*U. S. Dept. Agr., Dept. Circ. 337 (1925), pp. 4*).—Following up the work of Holloway (E. S. R., 49, p. 848) and that of Brandes and Klaphaak, above noted, also his own work with Ingram, previously noted (E. S. R., 50, p. 525), the author carried out in the spring of 1924 further tests at Cairo, Ga., with cane (Cayana variety, Chinese type) sprouted in the banks. Cuttings from 10 to 15 in. long were planted within 30 or 40 minutes after being treated by one of three different methods and the results of the experiments are presented in tabular form.

In the 1923 work of the author with Ingram, though practically all sprouted eyes planted without treatment grew, the treatment for 30 minutes at 50° C. (122° F.) to 51° killed nearly all the sprouted eyes. The tabulated results of the 1924 tests show that in each of the three methods of treatment used on the sprouted canes the sprouts in considerable numbers were left alive, though always fewer than half survived. These results indicate also a slight advantage for the milder two-heat treatment, 20 minues at 45° followed by 10 minutes at 50°, provided this is found effective in killing the insect pests, which phase of the matter was not investigated. The stronger two-heat treatment, 20 minutes at 46° followed by 10 minutes at 51°, left a smaller percentage of the sprouts alive than did the one-heat treatment at 50°. Marked stimulation, shown in awakening of dormant eyes, also in root system growth for at least 11 days, attended both the one-heat treatment and the milder of the two-heat treatments.

Provided these treatments prove to be effective in destroying the insect pests, it is believed that the method described will accomplish this result with a loss of only one-half or two-thirds of the sprouted eyes, with marked advantage as regards stimulation of growth of the dormant eyes if planted immediately after treatment.

The relation of seed weight to the growth of buckwheat in culture solution, D. Schmidt (*Soil Sci., 15 (1923), No. 4, pp. 285–292, figs. 2*).—Buckwheat plants having been grown in solution cultures approximately the same for all, it was found that seed of high medium weight produced better plants, considering the averages of several quantative measurements, than did seeds of lighter weight or abnormally heavy seeds, the order of superiority corresponding (plants from abnormally heavy seeds being excluded) to the order of seed weight. This order of superiority was maintained from the early seedling phase to maturity. Leaf areas were approximately proportional to dry weights of tops and to total dry weights, but no such relation was apparent between dry weights of roots and leaf areas.

The effect of the weight of the seed on the growth of the plant, D. Schmidt (*New Jersey Stas. Bul. 404 (1924), pp. 5–19*).—The object of this paper is to show the relation of the initial plant food supply in the seed to plant growth and crop production. The experiments herein described dealt with soy beans, buckwheat, Lima beans, and corn in soil cultures, the plants being grown from seeds of different weights but under comparable conditions.

Seeds of fairly high medium weight excelled, on the average, in several quantitatively estimated points of desirability, both lighter and abnormally heavy seeds, generally in the order of the seed weights. The advantage of the somewhat heavier seeds in these respects tended, however, to decrease or even sometimes to disappear toward maturity. Leaf areas were approximately pro-

portional to top and to total dry wight. In Lima bean, the average dry weight of beans produced always approximated closely 45 per cent of the top air-dry weight. From this an advantage is argued for growing large bean plants.

The producing power of Golden Bantam corn, as regards weight of ears (number and green weight), stalk (air-dry), and husk, varied in the same order as did the weight of the seed planted. Germination was generally more rapid in the light seeds. Germinating power was greater in seeds of medium weight or slightly higher by approximately 8 per cent than in very heavy or very light seeds (E. S. R., 51, p. 627). (See also above.)

Growth of beets in relation to sugar and other constituents [trans. title], V. Stehlík (*Ztschr. Zuckerindus. Čechoslovak. Repub.*, *49* (*1924*), *Nos. 1, pp. 1–7, figs. 3; 2, pp. 9–15, figs. 2; 3, pp. 17–22; abs. in Facts About Sugar, 19* (*1924*), *No. 18, p. 424*).—This series reports an extended investigation of the distribution of sugar and other classes of substances in the sugar beet at different stages of development.

The storing of sugar begins in the hypocotyl (neck) of the young beet, the most rapid accumulation occurring at the time of maximum leaf development (about the first days of August), when about 1.58 gm. of sugar is stored daily. The amount stored in the individual fiber-bundle rings is dependent on the development and size of the leaves associated therewith. Most of the sugar is found in the parenchyma zones between the fiber bundles.

The distribution of ash is approximately the reverse of that of sugar, the ash being more especially abundant where the cambial fiber-bundle rings are most active and where the least sugar collects. The distribution of the marc about coincides with that of the ash, and the same is in general true of the organic nonsugars. Nonsugars in general are most abundant in the top and near the surface of the beet.

The demonstration of physiological characters in early stages of germination [trans. title], F. Merkenschlager (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *58* (*1923*), *No. 19–24, pp. 461–464, figs. 2*).—The influence of sugar in calcium nitrate solutions is indicated, with citations and discussion of bearings.

The translocation of carbohydrates in the sugar maple, J. Adams (*Nature* [*London*], *112* (*1923*), *No. 2806, p. 207*).—The view expressed by Dixon (E. S. R., 48, p. 430) that the translocation of organic substances takes place by the xylem vessels is discussed, as are also the details presented by Jones, Edson, and Morse (E. S. R., 15, p. 853), in connection with data obtained by observations on two maples (*Acer saccharum*).

In order to determine whether the flow of sap came from bark or wood, several small branches on each tree were chosen which projected horizontally or inclined slightly upward. These were cut across at right angles to their length on March 1, 1923, the cut end was smoothed, and the bark peeled off close to the wood for a distance of about 1 in. from the cut end. In one tree sap commenced to flow on April 11 and ceased on April 27, while in the other the respective dates were April 17 and May 14. In no instance was sap observed to exude from the cut surface of the bark. Several observations were made on the rate of sap flow from a cut branch, together with records of temperature. The several observations are detailed.

Microscopical examination of twigs cut from each tree on March 1, and on May 7 when the buds were swelling, showed abundant starch grains in the medullary rays, but none in the pith. The amount of water present in several small branches 0.5 in. in diameter taken from each tree was also determined for the above dates, when it was found that each tree contained 1 per cent less water on May 7 than on March 1. The [illegible] sap was also observed in five other species of maple.

While some points in the metabolism of the maple sap may still be obscure, it is considered evident that the vessels of the wood are able to carry the sugar solution in both directions in the tree trunk and that the rate of flow is comparatively rapid.

Experiments on the decomposition of cellulose by aerobic bacteria, F. LÖHNIS and G. LOCHHEAD (*Centbl. Bakt.* [*etc.*], *2. Abt., 58* (*1923*), *No. 19–24, pp. 430–434*).—Macroscopic and microscopic results obtained from early work, as here briefly indicated, are followed by a short account of more recent findings (E. S. R., 50, pp. 526, 728) showing the need of further investigation.

Such morphological differences as have been noticed with the presumably impure growth of the thin rods and threads can not be accepted as valid proof of a mixed culture. Especially the globular darkly staining cells may be found, it is now known, in every bacterial culture, since they are normal reproductive organs of the bacteria. The same is true of the dissolving thin rods and threads.

Physiological study of Azotobacter chroococcum.—I, Influence of vitamine B (?) and nucleic acid on Azotobacter, A. ITANO (*Jour. Bact., 8* (*1923*), *No. 6, pp. 483–486*).—Preliminary studies conducted at the Massachusetts Experiment Station indicated that both the water-soluble vitamin B and phytonucleic acid exert a marked stimulating influence on Azotobacter A4 in regard to its growth and fixation of nitrogen.

Physiological study of Azotobacter chroococcum, beijerinckii, and vinelandii types, U. YAMAGATA and A. ITANO (*Jour. Bact., 8* (*1923*), *No. 6, pp. 521–531, figs. 2*).—Studies conducted at the Massachusetts Experiment Station on the relation of H-ion concentration in specially prepared culture solution to the growth of *A. chroococcum*, *A. beijerinckii*, and *A. vinelandii* are reported.

The results showed that the growth of the organisms at different pH values and after various periods seemed to vary greatly. At the end of 48 hours the growth of *A. chroococcum* took place at all pH values above 6.6, *A. beijerinckii* only at pH 7, and *A. vinelandii* at all pH values above 7.

The influence of calcium carbonate on Azotobacter seemed to vary with the species. The *beijerinckii* type grew very well in the absence of calcium carbonate, while the other two types, especially *vinelandii*, were very sensitive. At the end of 96 hours the following different degrees of toleration of H-ion concentration by each organism were observed, viz: *A. chroococcum* grew distinctly at all pH values above 6.6, *A. beijerinckii* at from 6.3 to 8, and *A. vinelandii* at all pH values above 7. At the end of 240 hours *A. chroococcum* and *A. vinelandii* both grew distinctly at all pH values above 6, while *A. beijerinckii* grew at from pH 6.3 to 9.2.

The employment of membranous filters in microbiology [trans. title], E. W. SCHMIDT (*Centbl. Bakt.* [*etc.*], *2. Abt., 58* (*1923*), *No. 19–24, pp. 464–469, figs. 3*).—Apparatus and technique are discussed in connection with the process of filtering out organisms.

The enzymic content of bacterial spores, G. L. A. RUEHLE (*Jour. Bact., 8* (*1923*), *No. 6, pp. 487–491*).—Recording preliminary studies on the possibility of demonstrating active enzymes in bacterial spores, the author describes the tests made, with results, concluding tentatively that bacterial spores do exhibit some enzymatic activity even when there is no evidence of germination.

Enzymatic regulation of stomatal aperture change [trans. title], F. WEBER (*Naturwissenschaften, 11* (*1923*), *No. 17, pp. 309–316, fig. 1*; *abs. in Nature* [*London*], *112* (*1923*), *No. 2811, p. 407*).—Chiefly, the mechanism of stomatal movement is here dealt with in a compact review of recent contributions, with suggestions as to needful further research.

The reduction of carbon dioxide by ultraviolet light, H. A. SPOEHR (*Jour. Amer. Chem. Soc., 45 (1923), No. 5, pp. 1184–1187*).—Attention is here confined to a discussion of some experiments on the reduction of carbonic acid to formaldehyde in glass by means of ultraviolet energy. Although the conclusions drawn can only with difficulty be applied directly to photosynthesis, they are considered as of significance theoretically. The findings of different authors are briefly reviewed, and previous work of the author is cited (E. S. R., 35, p. 821). Since the appearance of the statement by Baly, Heilbron, and Barker (E. S. R., 47, p. 728), the present author has reinvestigated the matter, and he presents the results of his work, which is briefly detailed as to method and tests employed.

Carbonic acid, potassium bicarbonate, calcium bicarbonate, and magnesium bicarbonate were all tested, but none of these gave the strong reactions for formaldehyde referred to above.

As catalysts, ferric chloride, uranium salts, and colloidal ferric hydroxide were tried, but all of the results were negative as regards formaldehyde and sugar. The question of the selective light filters was also taken up, and it was found that paraldehyde, itself, in water solution breaks down readily in ultraviolet light. The illuminated solution, besides containing acetaldehyde, reduces Fehling and Benedict solutions in the cold. All indications point to the formation of glycoaldehyde which, already at 60° C., goes over into a hexose sugar and reduces Benedict solution in the cold. Thus, paraldehyde, far from being a protection against sugar formation, yields, itself, independently of carbon dioxide, substances which reduce alkaline copper solutions. No evidence was obtained of the reduction of carbon dioxide itself to formaldehyde.

The effect of boric acid and borax on the broad bean and certain other plants, K. WARINGTON (*Ann. Bot. [London], 37 (1923), No. 148, pp. 629–672, pl. 1, figs. 6*).—In water culture a continual supply of boric acid appears to be essential to the healthy growth of the broad bean plant, concentrations of 1:12,500,000 to 1:25,000 H_3BO_3 being beneficial. In the absence of boric acid, death occurs in a characteristic manner, the apex of the shoot becoming withered and blackened, though the addition of boric acid even after these symptoms have set in results in a renewal of growth by means of new lateral shoots and roots. This type of dying never occurs in broad bean plants grown in pot culture, and it is concluded that sufficient boron is present, as a trace has been detected in the soils used.

The absence of boron does not cause death in barley. Excess of boric acid is poisonous to the broad bean, injury being apparent with 1:5,000 H_3BO_3 in water culture and with 0.5 gm. or over per 22.5 lbs. of soil in pot culture, according to the method of application. Smaller quantities added to the soil either cause no effect or else cause an increase in the green weight only. Boric acid is more poisonous to barley than to the broad bean. Injury is marked by retardation of germination; by chlorosis and later by brown markings of the leaves, the barley leaf becoming spotted, while that of the broad bean shows a brown band along the margins; and by retardation of maturity in the case of barley in soil culture.

Preliminary experiments show that several other plants, and especially *Phaseolus multiflorus* and *Trifolium incarnatum*, appear to derive benefit from boric acid in small quantities, though rye behaves as does barley except in case of low concentrations. Boron is found in the dried shoots and in the seed of broad bean plants grown in a nutrient solution containing no boron. In garden-grown plants a larger proportion of boron was present in the pod than in either the stems or leaves. Only a trace was detected in the barley seed or in the dried barley shoots grown in water culture.

The function of boron in the case of the broad bean appears to be nutritive rather than catalytic, since a supply is required throughout the life of the plant. A parallel is drawn between the action of boron on plants and the vitamins on animal life.

GENETICS

Organic adaptation to environment, edited by M. R. Thorpe (*New Haven: Yale Univ. Press; London: Humphrey Milford, 1924, pp. XVIII+312, pl. [1], figs. [40]*).—This book consists of a series of papers on organic adaptation to environments presented to the Paleontology Club of Yale University during 1922–23. The following are the titles of the papers and their authors: Introduction, by M. R. Thorpe; The Terrestrial Environment in Its Relation to Plant Life, by G. E. Nichols; the Protozoa and the Problem of Adaptation, by L. L. Woodruff; Environment as a Stabilizing Factor, by A. Petrunkevitch; Mutation and Environment, by W. R. Coe; Fossil Plants as Evidence for Resistance to Environment, by G. R. Wieland; Phases of Cephalopod Adaptation, by C. O. Dunbar; Dinosaurian Climatic Response, by R. S. Lull; and Environment and Racial Character, by E. Huntington.

Meiotic cytokinesis of Cannabis, H. C. McPhee (*Bot. Gaz., 78 (1924), No. 3, pp. 335–341, pl. 1*).—Counts made in the pollen mother cells showed that the reduced number of chromosomes in *C. sativa* is 10. The reduction division commonly occurs during the period from sunrise to noon, mitotic figures being comparatively rare in material collected during the afternoon or evening. The behavior of the chromosomes is normal, and no unusual features were noted. There is no morphological evidence that any one of the 10 chromosomes is a sex chromosome. The method of cytokinesis is by furrowing, the furrows appearing at the periphery of the cytoplasm and at points equidistant from the mother cell nuclei and extending rapidly to the center of the mother cell, cutting it into four parts.

Chlorophyll deficiencies in sorghum, A. B. Conner and R. E. Karper (*Jour. Heredity, 15 (1924), No. 9, pp. 377, 378, fig. 1*).—Albinos and virescent white seedlings were observed in plats of Sudan grass and standard Blackhull kafir at the Texas Experiment Station. The mode of inheritance of these chlorophyll deficiencies has not been determined definitely in studies in progress with kafir.

A genetic analysis of variegation, W. H. Eyster (*Genetics, 9 (1924), No. 4, pp. 372–404, pl. 1, figs. 7*).—A genetic interpretation of the inconstancy peculiar to variegated plants and animals is attempted, based on studies carried on at the Missouri Experiment Station with material originating in pedigreed cultures from a single ear of corn having a dilute red or orange pericarp and a white cob.

Orange pericarp in maize varies in color from whitish to deep cherry red and gives rise to variegations of a number of distinct types. The progeny of an ear of medium orange pericarp includes ears ranging in color from whitish to red in the form of a frequency curve. Light orange ears produce variegations prevailingly light in pattern, while dark orange ears tend to give rise to heavy variegations. A correlation evidently exists between color intensity of orange pericarp and variegation pattern. According to the interpretation, the color intensity of the orange pericarp and the number and size of the color markings of the variegations increase with the number of pigment-producing gene elements in the pericarp gene. All color and pattern changes seem to be reversible, but with different frequencies

The gene for orange pericarp is thought to be made up of pigment-producing and nonpigment-producing gene elments. Variations in the orange color are due to different proportions of the contrasting gene elements in the pericarp gene. The occurrence of adjacent segments of red and white (colorless) of equal size, on an otherwise orange colored kernel, indicates that the gene for orange pericarp was so divided that its pigment-producing elements were separated from its nonpigment-producing elements by the mechanism of mitosis. Variegations are produced when the contrasting gene elements become completely segregated in the somatic tissues in the course of development. Since variegations in general, in animals as well as in plants, are fundamentally alike in their inconstancy and in the nature of their color changes, apparently all typical variegations may be produced in a manner similar to that described for maize pericarp.

Two new hereditary tumors in Drosophila, I. T. WILSON (*Genetics, 9 (1924), No. 4, pp. 343–362, figs. 16*).—The inheritance of two types of tumors in Drosophila is described as observed at Heidelberg University, Tiffin, Ohio. Both types produced black pigment, but one type, described as No. 1, attacks the larva early in its development, is more extensive in its growth, spreads by metastasis, and the resulting mortality is greater. The other type, No. 2, appears in the latter part of larval life, is less extensive in its growth, and mortality is not so great. A pure line of flies having a large percentage of tumors of the No. 1 type was crossed with mutant flies having factors located in the different chromosomes, for a determination of the mode of inheritance of this type of tumor.

Of the 1,235 F_1 flies examined only 2 developed tumors, while 64 of the 13,765 F_2 flies showed tumor development. The results of the individual crosses indicated that three factors were probably responsible, the main one being located in the second chromosome with two others in the X and third chromosomes. The genes need not be homozygous but may be heterozygous for the tumor development.

In studying the inheritance of tumors of the second type, similar crosses were made and at least three factors were found responsible, the most essential ones being located in the second and third chromosomes. One of these factors must be homozygous for tumor development, while the other may be heterozygous. The first or fourth chromosome also contains recessive modifiers which may increase tumor production. Tumors occurred in 1.9 per cent of the F_2 flies derived from inter se crosses of F_1s. Of 230 offspring from a cross of the two tumor strains only 1 of the F_1s had a tumor, making it evident that different factors determine the two types. Tumors occurred in 4.6 per cent of the F_2s. This was more than the sum of the tumor flies (0.46 and 2.15) occurring in the inter se crosses with other mutant strains, indicating that some of the same factors are responsible for both types. The occurrence of variations in the percentage of tumors from time to time pointed toward the operation of environmental conditions.

In a study of the effect of food supply, 32, 23, 20, and 15 per cent, respectively, developed tumors when the average numbers of larvae having access to an equal food supply were 15, 32, 69, and 142. The tumors were larger and consisted of many smaller ones when the food was most plentiful.

On the inheritance of acquired immunity [trans. title], S. METALNIKOV (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 10, pp. 514–516*).—Caterpillars of the bee moth *Galleria mellonella* were immunized against the organism causing vibrionic cholera by inoculation with cultures attenuated by heat. Part of the offspring from the inoculated population was also immunized in successive generations, while another part was inoculated with the virulent organism. It

was found that the survival in the latter group increased from 0 to 75 per cent in the first to the ninth generation. The increase in the survivors was rather gradual except for the fourth and fifth generations, when the dose was exceptionally heavy.

It is concluded that these data offer evidence of the inheritance of acquired immunity.

High fecundity in Leghorns as an inherited character, G. W. HERVEY (*New Jersey Stas. Hints to Poultrymen, 13 (1925), No. 6, pp. 4, fig. 1*).—Data are presented relative to the seasonal and annual egg production of 682 White Leghorn pullets in the Vineland and Bergen County egg-laying contests.

The total data showed no relationship between the dams or sires' dams production and the seasonal or annual production of the daughters, but studies of individual matings indicated that factors for high or low production were transmitted by the sire or the dam. Selection of the breeding flock is suggested on the basis of the winter and summer trap-nest records.

The inheritance of a drinking habit in family X [trans. title], H. M. KROON (*Genetica [The Hague], 6 (1924), No. 4, pp. 391–400, fig. 1*).—A study of the inheritance of the drinking habit in a family has indicated that the characteristic is due to a single factor dominant to the normal in the male heterozygote, but that heterozygous females are normal. There was some indication of sex linkage, but the author favors the interpretation of this factor being sex-limited.

Heritable characters of maize.—[XIX], Polkadot leaves, W. H. EYSTER (*Jour. Heredity, 15 (1924), No. 9, pp. 397–400, fig. 1*).—The nineteenth number of this series (E. S. R., 51, p. 828) deals with the chlorophyll pattern termed "polkadot leaves," said to have been first observed in an inbred strain of Boone County White corn. In genetic studies at the Missouri Experiment Station this character, whose responsible factor has been designated *pk*, appeared to be inherited as a simple recessive. According to evidence at hand, the factor *pk* probably belongs to the *c-sh-wx* linkage group.

Heritable characters of maize.—XX, Iojap-striping, a chlorophyll defect, M. T. JENKINS (*Jour. Heredity, 15 (1924), No. 11, pp. 467–472, figs. 2*).—Chlorophyll defects were observed in the progenies of 15 of 16 corn varieties, obtained from the Corn Belt and elsewhere and self-pollinated at the Iowa Experiment Station. Iojap-striping, *Ij ij*, a variation seen in Iodent corn and similar in appearance to japonica striping, was found due to a different factor than the latter and to be inherited as a simple recessive. Some of the data suggest that there is either a second factor for striped seedlings or more than one factor for yellow.

Heritable characters of maize.—XXI, A new dominant hereditary character—Teopod, E. W. LINDSTROM (*Jour. Heredity, 16 (1925), No. 4, pp. 135–140, figs. 3*).—A new type of corn, termed "Teopod" because of its resemblance to teosinte and pod corn, is characterized by extremely narrow leaves, profuse suckering, stalks covered with a wax or bloom, and kernels inclosed in long glumes. The staminate inflorescence is at most a solitary rachis bearing functional anthers, and accordingly Teopod is self-pollinated only with great difficulty. The ears each have a distinct cob and are often numerous, but even on the best developed plants they are small, bearing fewer than 100 seeds. In studies at the Iowa State College, Teopod *Tp tp* proved to be inherited as a simple character dominant over normal corn. Its history points to a recent origin by mutation, since it has little survival value, and especially because it is inherited in a way distinctly unlike known corn-teosinte hybrids.

Waxy endosperm in New England maize, P. C. MANGELSDORF (*Science, 60 (1924), No. 1549, pp. 222, 223*).—The type of endosperm texture in maize termed

"waxy" recently appeared in Sanford White Flint, a New England variety grown at the Connecticut Experiment Station. This strain and a waxy strain obtained originally from China by G. N. Collins appeared to be genetically identical in their type of endosperm. It is thought that the origin, in an American variety, of this peculiar endosperm texture previously found only in several isolated Asiatic localities (E. S. R., 44, p. 230), will probably remain a matter for speculation.

Complementary genes for chlorophyll development in maize and their linkage relations, E. W. Lindstrom (*Genetics, 9 (1924), No. 4, pp. 305–326*).—*An intensive study of the phase of the chlorophyll situation in corn involving* albino seedlings was made at Iowa State College.

Three different genes for complete albinism in maize seedlings were found to be genetically distinct, with their normal allelomorphs acting in a complementary manner to cause the development of normal chlorophyll. Seedling ratios of 3:1, 9:7, and 27:37 green to albino plants were found to occur when mono-, di- or triheterozygous green plants, respectively, were self-fertilized. Extensive data concerning the 27:37 ratios derived from green plants of the composition $W_1w_1W_2w_2W_3w_3$ show such a close approximation to the theoretical expectancy that these three factor pairs must be independently inherited. This independent inheritance appeared to be verified by the fact that linkage tests proved that W_1 belongs in the *Y–Pl–Sm* group and that W_3 falls in the *R–L–G* linkage group. It was also shown that w_2 is the albino gene linked with a factor for defective endosperm. W_3 seemed to be independent of the two linkage groups mentioned and to belong neither in the *B–Lg* nor in the *C–L–Sh–Wx* linkage groups.

Crossover modifiers in the third chromosome of Drosophila melanogaster, F. Payne (*Genetics, 9 (1924), No. 4, pp. 327–342, fig. 1*).—The results are reported of an analysis of the crossover modifiers occurring in the third chromosome of a mutant stock of *D. melanogaster* having pointed wings, described as lance, which appeared in stocks selected for an increased number of bristles on the scutellum at the Indiana University.

Much variation among lance wings was observed, especially in males. The factor for the character is located in the second chromosome. In conducting the work, the lance stock was mated with several stocks, but mainly with sooty, rough, and claret and "IIIple" stock (roughoid, hairy, scarlet, peach, spineless, and sooty). Suitable backcrosses were made and other offspring were also obtained.

The results indicated that one of the third chromosomes of the lance stock carried two factors modifying the crossover percentages C_{IIIPL} and C_{IIIPR}. The former factor is located in the region of hairy and scarlet and almost eliminates crossing-over in that end of the chromosome, while the latter factor is located near ebony and practically prevents crossing-over in that end. Each is associated with a lethal factor. Significant reductions in the crossover values between roughoid and hairy from 26 to 18.9 per cent, with probably insignificant reductions in the amount of crossing-over occurring in other regions, indicated the presence of another crossover modifier either in the other third chromosome of the lance stock or in the left end of the third chromosome of the IIIple. A lethal factor was also present. The lance stock was maintained as a balanced lethal, since different lethals are carried by the two chromosomes and since crossing-over between them is prevented.

Sex-determination in birds, F. W. R. Brambell (*Sci. Prog. [London], 19 (1924), No. 74, pp. 257–265, pl. 1*).—Several cases of sex reversal in birds described by other investigators are reviewed. The conclusions are that every fertilised ovum has the power of developing into either sex, with reversal ...

ring at any time during its life. The factors responsible for the determination of sex are the sex chromosomes, which are very important if not the chief determiners, nutrition, and hormone action, while other metabolic and pathological conditions probably play parts.

Correlations of body weight, body length, and tail length in normal and alcoholic albino rats, F. B. Hanson and F. Heys (*Genetics, 9 (1924), No. 4, pp. 368–371, fig. 1*).—The correlation coefficients between body weight and body length, body weight and tail length, and body length and tail length have been calculated for albino rats from 20 to 80 days of age by 10-day periods at the Washington University, one group of the rats being treated daily in an air-tight tank with alcoholic fumes and the other group being maintained as controls. Both groups were inbred, and the results are based on the offspring of the first three generations.

Of the 60 correlation coefficients determined for the two groups 9 were above 0.9, 43 were between 0.8 and 0.9, and 8 were between 0.7 and 0.8. No significant differences in the correlations were observed at different ages or for the two sexes. The alcohol treatment, while lowering the body weight markedly, did not disturb the relations of the weight to the body length and tail length.

FIELD CROPS

Varietal experiments with wheat, oats, barley, rye, and buckwheat, R. J. Garber, K. S. Quisenberry, T. E. Odland, and T. C. McIlvaine (*West Virginia Sta. Bul. 192 (1924), pp. 26, figs. 4*).—Reliable 80 and Fulhio were among the highest yielding winter wheats both at the station and at Maggie. Ashland and Fulcaster were also outstanding at the station and Trumbull and Gladden at Maggie. Gopher, a pure line selection from Sixty-Day oats, and Iowa 103 or Albion were among the highest yielding oats varieties. Its weaker straw makes Albion more liable to lodging than Gopher. Rosen rye led at the station and Abruzzi rye at Maggie. Manchuria outyielded the other spring barleys, and Japanese buckwheat led the buckwheats at the station.

Discussion of the application of experimental error to the results of these trials is appended.

Cultural methods for corn and grain sorghums on Oklahoma soils, H. F. Murphy (*Oklahoma Sta. Bul. 150 (1925), pp. 7*).—Tabulations show the effect of weeds and cultural treatment on the moisture content of plat soils at different times and for different periods. Competition between crops and weeds for soil moisture increased with advance of the season, when rainfall decreases and weed growth becomes greater. Decline in acre yields followed delay in plowing for corn, peanuts, cotton, and wheat. Cultivation experiments with kafir suggest for sandy to silt loam soils shallow cultivation as often as needed to control weeds. Probably more tillage would be needed to keep the heavier soils open for moisture reception and for aeration. Harrowing just as the crop is emerging and after it is up will aid in weed control and will lessen the need for later cultivation.

[Field crops work in Assam, 1922–23 and 1923–24], W. L. Scott and K. L. Barua (*Assam Agr. Dept. Rpts., 1922–23, pp. 3–6; 1923–24, pp. 4–9, pls. 2*).—The continuation of earlier experiments (E. S. R., 48, p. 629) is reported on briefly.

[Field crops work in Burma, 1922 and 1923], J. Clague and A. McKerral (*Burma Dept. Agr. Rpts. 1922, pp. 3–9, 14, 15; 1923, pp. 2–7*).—The progress of experiments with field crops is reviewed as heretofore (E. S. R., 50, p. 231).

Crude oil, liquid fuel oil, and calcium hyposulfite used in sprays all proved expensive and unsatisfactory in eradication experiments with water hyacinth at Mandalay. Solutions of arsenic killed the plants, the cost ranging from Rs. 11 ($5.35) per acre for ordinary sized plants in dry weather to Rs. 58 for large, closely packed plants in wet weather. Sea water also killed the plants in a few days, and even 0.1 per cent of brine was visibly harmful. Attempts to burn the growing plants with a blow lamp were unsuccessful. While steam was also tried, the loss of heat was enormous. With a boiler pressure of 150 lbs., the temperature 3 ft. from the nozzle of a hundred-foot 1-in. pipe was only about blood heat.

[Field crops work in Tanganyika], H. Wolfe (*Tanganyika Ter. Dept. Agr. Rpt. [1923–24], pp. 11, 12, 13, 14, 15–19*).—The progress of investigations noted previously (E. S. R., 50, p. 433) is reviewed.

A statistical study of the relation between seed-ear characters and productiveness in corn, F. D. Richey and J. G. Willier (*U. S. Dept. Agr. Bul. 1321 (1925), pp. 20*).—Data from ear-to-row plats in four varieties of corn (C. I. Nos. 77, 119, 120, and 133), comprising 3,265 ears in all and extending over 47 crop years, were studied for possible relations between productiveness and some physical characters of the seed ears.

Accidental variation in soil and experimental conditions appeared responsible for much, possibly 90 per cent, of the total variation in yield. From 2.5 to 6.7 per cent of the total variation in yield in the different varieties was a function of variation in the ear characters studied.

On the basis of multiple regression equations involving seven ear characters, yield was related positively to weight of ear and length of ear and negatively to number of rows and number of kernels per row in each of the four varieties. Similarly, yield was related positively to butt circumference and weight of cob and negatively to tip circumference in each of three varieties, the relations being reversed in the fourth variety. The use of weight of ear, number of rows, and number of kernels per row in a multiple regression equation gave almost as good a predicting equation in each of the varieties as the inclusion of the four other characters and was the best general predicting equation involving only three characters. Because of varietal differences, the substitution of weight of cob for weight of ear in C. I. No. 77 and butt circumference for number of kernels per row in C. I. No. 133 gave a better three-character predicting equation in these varieties.

Selecting longer, heavier ears with proportionately heavy cobs and with relatively few rows of wide, thick kernels is considered warranted as a means of obtaining a supply of good seed for general planting. However, nothing in the data seemed to indicate that selection on the basis of seed-ear characters could be used as a method of breeding.

The cultivation of corn: Weed control vs. moisture conservation, D. C. Wimer and M. B. Harland (*Illinois Sta. Bul. 259 (1925), pp. 174–196, figs. 8*).—Earlier data on corn cultivation (E. S. R., 33, p. 528) is revised in this bulletin, which reports the conclusion of the work on this problem. The information presented is intended to assist in developing principles underlying successful cultivation of corn and not to recommend specific methods or particular implements.

In experiments from 1916 to 1921, inclusive, terminated because of the location of a stadium on the field, corn yields always averaged higher on fertilized than on corresponding unfertilized plats, but the increases were probably uneconomical. Removal of weeds by scraping with a hoe instead of by cultivation increased acre yield 46.3 and 44 bu. on the unfertilized and fertilized plats, respectively. Unfertilized plats that were scraped did not differ

significantly in average yields from those that were cultivated, indicating that the greatest value of cultivation with either blades or shovels was to eradicate weeds. When fertilized, cultivated plats produced an average of 2.5 to 3.9 bu. per acre more than scraped plats, perhaps suggesting that the corn plant grown on a heavily fertilized soil might depend less upon the natural fertility of the surface soil, or perhaps has greater power of recovery from root injury caused by cultivation.

No definite relation was apparent between the total rainfall during the growing period and the cultivation needs of corn in seasons of deficient rainfall.

Cotton experiments, South Mississippi Branch Experiment Station, E. B. Ferris (*Mississippi Sta. Circ. 56* (*1924*), *pp. 8*).—Ranked as to value, varietal leaders in 1923 included Trice strains, Delfos 6102, Willis (developed from Triumph by S. Willis, Graysport, Miss.), and Lone Star 65, and in 1924, D. & P. L. No. 4, Half and Half, Delfos 631, Cleveland (Coker), and Cleveland 54. Delfos, Trice, Lone Star, and Express have led in average value during the period 1921–1924. Fertilizer tests showed the value of potash for cotton on old land in the section. Spacing and time of planting trials and cooperative fertilizer tests are also noted briefly.

The influence of humidity on the elastic properties of cotton, F. T. Peirce (*Jour. Textile Inst., 15* (*1924*), *No. 11, pp. T501–T518, figs. 5*).—The variation of the rigidity of raw cotton fibers from dryness to saturation at 20° C. (68° F.) is considered under the following topics:

I. *The rigidity of raw cotton hairs at 20° C.*—The rigidity of the fiber was measured by the method described in a previous paper (E. S. R., 49, p. 131) but under closely controlled humidity at 20°. Results on 70 specimens ranging from the finest Sea Island to the coarsest Indian were compared by expressing the observations as ratios to the rigidity at 50 per cent relative humidity. The relation between rigidity and humidity was then given by an S-shaped curve, the value at saturation being less than one-sixth of that in dry air. The water vapor in the air seemed to affect the elastic properties of cotton only indirectly, the immediate cause being the absorbed moisture. Increase of temperature reduces the rigidity at constant moisture regain, but this is partly counteracted by the decrease of absorbed moisture at constant humidity. The effect of temperature is of a lower order than that of humidity in the limits of variation normally encountered. In saturated air, the rigidity appears to increase with change of temperature above or below 20°.

II. *The modulus of rigidity at 20° C.*—From analysis of the variations of individual fibers, the differences seem mainly due to different hygroscopicity. At intermediate humidities the differences are much greater than those between the mean values of different varieties obtained by weighing bulk samples. The absorption does not appear to be a characteristic of the variety. In general the more fully thickened fibers absorb less moisture, and the differences may be attributed to differences in porosity and minor chemical constituents due more to environment and development than to heredity.

The stress/strain relationships of cotton hairs: The time factor, G. E. Collins (*Jour. Textile Inst., 15* (*1924*), *No. 11, pp. T519–T528, figs. 4*).—The present study deals with the changes in dimensions of single cotton fibers under longitudinal stresses in their relation to the time of application of the loads. Observations were made on loaded single cotton fibers immersed in water at 20° C. (68° F.). Elongation and recovery from strain were found to be irregular processes which may continue for long periods, though frequent repetition of the loading conditions tends to the establishment of an elastic state. Other conclusions drawn from these experiments were as follows:

Cotton fibers in water when loaded longitudinally exhibit an irregular extension, equilibrium being attained in from 5,000 to 10,000 minutes with stresses of the order of 10^8 *dynes per square centimeter*, although a tendency to a temporary equilibrium at from 0.5 to 2 hours is frequently manifested. The stress/strain value sinks to 0.74 of its value at 1 hour in the subsequent period. The recovery from strain is a smoother process. The fractional permanent loss of sectional area is greater than the fractional permanent longitudinal strain. With stresses of this order, application of the load for a few seconds suffices to effect permanent strain. Under fixed conditions of stress and time of application, a reversible cycle is attainable by repetition. Increase of time of application or stress produces further permanent strain. Fibers loaded to equilibrium likewise exhibit elastic behavior after one or two cycles, the stress/strain value rising to a constant.

Seed flax as a farm crop in 1925, A. C. Dillman, A. C. Arny, C. McKee, T. E. Stoa, and A. N. Hume (*U. S. Dept. Agr., Dept. Circ. 341 (1925), pp. 14*).—The status of flaxseed production is described, with statistics on production and consumption in the United States, acre income from flax, flaxseed prices and the tariff, and on world production. Based on experimental results, the experiment station agronomists of North Dakota, Minnesota, South Dakota, and Montana, the leading flax-producing States in order of production, have given information on production costs, crop sequence, varieties, cultural methods and field practices, and the merits of flax-wheat mixed cropping. Available departmental and station publications on seed flax are listed.

A new variety of wild mountain rye in Transcaucasia [trans. title], A. A. Grossheim (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant Breeding*), *13 (1922–23), No. 2, pp. 461–482*).—*Secale montanum* is found in Spain, Sicily, and Morocco, *S. dalmaticum* in Dalmatia and Herzegovina, and an undescribed variety on the Balkan Peninsula and in the western part of the main range of the Caucasus, according to a general survey by the author. *S. anatolicum* grows in western Asia, *S. ciliatoglume* in Kurdistan, and *S. vavilovi*, a newly described variety, in the districts adjoining the middle course of the Aras. In the three western varieties the differences in length of the empty glume and the lower flowering glume is 3 mm. and in the 3 eastern sorts 1 mm. The awn of the western ryes is as long as the lower flowering glume, while in the eastern ryes it may vary from an equal length to double that of the lower flowering glume.

S. vavilovi Grossh. is annual, while the others are perennial, and it is characterized by a glaucous bloom, short habit, and small spikelets. It is ecologically a psammophyte and occurs at lower altitudes than the other mountain ryes. *S. vavilovi* appears to be an intermediate between *S. montanum* and *S. cereale*, possibly derived from the former.

Preliminary report on the agricultural aspects of a sugar industry in Palestine, M. Elazari (*Zionist Organ. Inst. Agr.* [etc.] *Agr. Expt. Sta. Bul. 1 (1924), pp. 108, pls. 6, fig. 1*).—This report deals with the present status of sugar cane culture in Palestine; summarizes the results of cultural, variety and fertilizer experiments with sugar cane in the Jordan Valley; gives a brief account of the sugar industry in Egypt; and discusses in some detail the possibilities of a sugar industry in Palestine, involving both cane and sugar beets.

Deterioration of sugar cane between time of cutting and milling [trans. title], J. Kuyper (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1924, No. 2, pp. 25–54*).—Experiments on a number of plantations in Java are summarized, together with a résumé of the work of others. Repli-

cated tests made on whole loads of sugar cane from uniform fields are held requisite for reliable results.

The Brix either remained constant or else rose slightly, whereas the purity of the juice fell steadily and at an increasing rate. Deterioration increased rapidly following the second day after cutting. Purity fell more rapidly in cane exposed to the sun than in cane kept shaded. The variety D. I. 52 deteriorated much faster than E. K. 28. A greater decline in purity was also noted when the cane cut was past maturity. The best practice is to mill the cane as soon as practicable after cutting, within two days at the utmost.

Sweet potato experiments, South Mississippi Branch Experiment Station, W. S. ANDERSON and F. B. RICHARDSON (*Mississippi Sta. Circ. 57 (1924), pp. 7*).—The results of variety, spacing, fertilizer, and storage tests and selection work with sweet potatoes are summarized. Porto Rico and Nancy Hall were the most promising of the varieties. A complete fertilizer appeared to give the greatest increase over unfertilized plats. A gradual decline in yield was most noticeable in the plats receiving incomplete fertilizers and the checks.

The degeneration of wheat [trans title], V. PISAREV (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 59–70*).—Wheat grown in fields near the railroad in Irkutsk Government from seed imported from Western Siberia was composed of a mixture of common varieties and a slight amount of durum and club wheat, and required 110 days to ripen, too long for the region. When a typical sample originally containing *Triticum vulgare lutescens* 72 per cent, *T. vulgare ferrugineum* 10.9, *T. vulgare erythrospermum* 9.3, *T. vulgare milturum* 6.1, and *T. durum* and *T. compactum* 1.7 per cent was grown during the period 1913–1917, the proportions of these constituents varied annually. Examination in 1917 showed the respective percentages to amount to 7.6, 82.4, 5.7, 4.3, and 0. *T. durum* and *T. compactum* disappeared in the second year.

Wheats of Crimea [trans. title], I. V. IAKUSHKIN (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 71–147*).—An extensive survey, concerned with the wheats of Crimea and Taurida, Russia, showed *Triticum vulgare lutescens* to predominate among the samples of spring wheat studied, although slight admixtures of *caesium*, *erythrospermum*, and *milturum* were noted. The durums of north Taurida contained representatives of the fundamental varieties, *valenciae*, *leucomelan*, and *leucurum*. Seedings of about 1,000 samples of winter wheat from all parts of Taurida revealed 90 per cent of all spikes to pertain to *erythrospermum*. In fact two-thirds of all samples were pure *erythrospermum*. A small percentage of *ferrugineum* was also present. Awnless varieties were very rare, and velvet varieties were not found. The chief type for poor soils seems to be *erythrospermum*, while on more fertile soils considerable of the area is seeded to other varieties. The principal varieties were also compared biometrically.

Persian wheat in Transcaucasia [trans. title], P. M. ZHUKOVSKIĬ (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 45–55, pls. 2, figs. 13*).—Persian wheat (*Triticum persicum* Vavilov), regarded as a distinct species, has been found under cultivation in central Transcaucasia and four varieties described. *T. persicum* is characterized by a spike similar to that of *T. vulgare* but differing therefrom by a very thin rachis, long parallel awns, long awns upon the empty glume, comparatively full straw, and a vitreous kernel covered with a silvery efflorescence. *T. persicum* is characterized by 28 diploid chromosomes and is said to be absolutely immune to *Erysiphe graminis*. *T. persicum* crossed with *T. vulgare* produces sterile or partially sterile hybrids.

Varieties of Sesamum indicum L. cultivated in Turkestan [trans. title], G. S. Zaĭtsev (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant Breeding*), *13* (*1922–23*), *No. 2, pp. 371–389*).—Forty-one botanical varieties of *S. indicum* grown in Turkestan are described with keys based on ten plant characters.

Weed elements in the seed material of Saratov Province [trans. title], E. A. Stoletova (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant Breeding*), *13* (*1922–23*), *No. 2, pp. 283–353*).—Examination at the Saratov Seed Testing Station of the seed used for planting in the Province showed the presence of 124 species of weeds. According to the tabulations and the English summary, the weed seed found most frequently in the several crops were as follows:

Winter rye—*Agropyron repens*, *Echinospermum lappula*, and *Thlaspi arvense*; spring wheat—*Agrostemma githago*, *Agropyron repens*, *Polygonum convolvulus*, *E. lappula*, *Vaccaria parviflora*, and *Convolvulus arvensis*; winter wheat—*E. lappula*, *P. convolvulus*, and *Agrostemma githago*; barley—*P. convolvulus*, *E. lappula*, *C. arvensis*, *A. githago*, and *V. parviflora*; oats—*A. githago*, *Agropyron repens*, *P. convolvulus*, *P. lapathifolium*, and *E. lappula*; millet—*Chenopodium album*, *E. lappula*, *P. convolvulus*, and *P. lapathifolium*; lentil—*A. githago*, *E. lappula*, *P. convolvulus*, and *Agropyron repens*; hemp—*C. album* and *E. lappula*; and flax—*C. album*, *Camelina sativa*, and *P. convolvulus*.

HORTICULTURE

Studies in the transplanting of vegetable plants, W. E. Loomis (*New York Cornell Sta. Mem. 87* (*1925*), *pp. 3–63, figs. 21*).—A comprehensive study of various factors concerned in transplanting indicated that the rate of new root formation is the most important consideration in the reestablishment of vegetable plants. Other factors, such as absorptive capacity of the transplanted root system, the resistance of the top to wilting, the rate of growth, and the susceptibility of the plant to stunting, are deemed important only as they tend to bridge the gap between one root system and the next.

Greenhouse studies indicated that all vegetables may be transplanted with little or no injury in their seedling stage, and that transplanting tends to markedly increase the branching tendency of the roots. Studies with plants of different transplanting capacities indicated that all were equally resistant to rapid wilting at the time of transplanting. However, easily transplanted species, such as cabbage and tomatoes, were better able to withstand subsequent unfavorable conditions, presumably because of their more rapid root recovery.

Working with several species, the author found that hardening causes a greater change in the depression of the freezing point in easily than in difficultly transplanted plants. Imbibition studies with dried tissue of hardened and tender plants indicated that the errors of this method are too large to permit its use in the determination of hardening capacities. Studies of transpiration and of the rate of drying of cut leaves showed no striking differences between hardened and tender tissues or in the correlations with ease of transplanting. After transplanting there was a more rapid recovery of the normal rate of transpiration in hardened than in tender plants. The carbohydrates of tender, easily transplanted plants were observed to pass through a maximum corresponding roughly to the initiation of new root growth. As roots developed, top growth was resumed and the carbohydrate value rapidly dropped to normal. The high initial carbohydrate content of hardened plants tended to

shorten this adjustment period. The cucumber, a species transplanted with difficulty, did not show this carbohydrate maximum.

Observing that the roots of some difficultly transplanted vegetables developed a corky layer in the endodermis or in a periderm layer, the author suggests that this suberization may possibly render the roots ineffective in water absorption as compared, for example, with tomato roots, which are apparently capable of a limited amount of water intake immediately following transplanting.

In general conclusion, the author points out that the investigation has shown that the general effect of transplanting is to retard development, the seriousness of the injury being dependent upon the species, the age of the plant, and the conditions under which it is transplanted. Transplanting was not found to be beneficial in itself, as was originally believed, but is justified only as an economic expedient for saving valuable seed and for conserving greenhouse or frame space.

Tomato experiments at the South Mississippi Experiment Station, W. S. Anderson and F. B. Richardson (*Mississippi Sta. Circ. 58 (1924), pp. 7*).—Among several varieties of tomatoes tested in 1921 and 1922, the Norton, a U. S. Department of Agriculture origination, because of its wilt-resistant qualities ranked first in yield both years. A selection of Norton compared favorably with plants raised from seed of the variety obtained directly from the Department of Agriculture.

Based on four years' results, barnyard manure applied at the rate of 16 tons per acre was the best fertilizer for tomatoes, giving an increase of 80.6 bu. per acre above the leading check plat and 66.4 bu. above the leading commercial fertilizer plat, which was treated with 120 lbs. of dried blood, 70 lbs. of nitrate of soda, and 240 lbs. of acid phosphate per acre.

Analyses of materials sold as insecticides and fungicides during 1924, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 407 (1924), pp. 5–16*).—Herein are presented the results of analyses of materials collected during the year 1924 as in previous years (E. S. R., 51, p. 39).

Spraying calendar, W. C. Dutton, R. H. Pettit, C. W. Bennett, and H. A. Cardinell (*Michigan Sta. Spec. Bul. 140 (1925), pp. 3–29, figs. 10*).—Accompanied by a brief discussion of the necessity of thorough and timely spraying and the use of adequate pressure, the authors present schedules for the more common fruits grown in the State, including the apple, pear, cherry, peach, plum, grape, and various bush fruits. Methods of handling and preparing various spray materials are discussed, together with notes on the spraying of young, nonbearing orchards.

[Spray calendars for New Jersey fruits] (*New Jersey Stas. Circs. 173 (1925), pp. 4, fig. 1; 174, pp. 4, figs. 3*).—Presenting concise instructions for spraying apples and quinces and the peach, these pamphlets are designed to supersede Circulars 162 and 163, previously noted (E. S. R., 51, p. 144).

Systematic pomology, U. P. Hedrick (*New York: Macmillan Co., 1925, pp. XVII+488, pls. 24, figs. 304*).—Based in large part upon the well-known fruit monographs of the New York State Experiment Station, the latest of which to appear was The Pears of New York (E. S. R., 48, p. 537), this manual, dealing with fruits grown in the Temperate Zone of North America, is designed to serve primarily as a text for schools and colleges. However, it is believed that the material should have general interest and value, especially for those interested in the identification of fruits.

Pruning bearing deciduous fruit trees, W. P. Tufts (*California Sta. Bul. 386 (1925), pp. 3–47, figs. 21*).—Beginning with a general discussion of the fruit-bearing structures in common fruit species such as the apple, pear, peach

apricot, plum, etc., and of the nutritional conditions within the tree which probably underlie production and nonproduction, the author outlines in detail the principles and practices of pruning the various fruits, pointing out the deleterious effect of heavy pruning in reducing vegetative growth and fruit production. The suggestion that the dormant season is the best time for pruning deciduous fruits is borne out by records taken on Muir peaches, wherein the production of the summer-headed trees was considerably lower than that of the winter-headed trees. Trunk measurements of the same trees showed that summer heading had also reduced growth. In the case of 6-year-old Royal apricots, lightly pruned trees averaged 200.6 lbs. of fruit as compared with 23.9 lbs. for thinned and severely headed trees. Work with older trees indicated that light heading is needed to induce sufficient vegetative activity for the production of fruit-bearing spurs. Suggestions are given for the treatment of pruning wounds.

Changes produced in apple trees by various types of pruning, H. D. Hooker, Jr. (*Missouri Sta. Research Bul. 72 (1924), pp. 3–11, fig. 1*).—With a view to explaining upon a physiological basis certain of the responses of young apple trees to different types of late winter pruning, determinations were made in the spring of 1924 of the moisture, carbohydrate, and nitrogen contents of the recent and new wood upon 5-year-old Jonathan apple trees pruned on April 3 in different ways. Certain of the unpruned trees were treated with nitrate of soda on the same date.

The moisture content showed a wide variation, ranging from 41 per cent in tips of the 2-year-old wood on April 3 to 76.8 per cent in the new growth on leaders of nitrated, unpruned trees on May 10. Heading markedly increased the moisture content at the cut ends and slightly increased the moisture content of the 2-year-old wood. Thinning had practically no effect on moisture content during the two weeks succeeding the treatment, but on May 10 the percentage of water was everywhere greater than in the check trees.

The largest percentages of total and reducing sugars were found in the tips of leaders sampled April 3. The largest value, 1.17 per cent, for nonreducing sugars was found in April 17 samples of 1-year-old wood from thinned trees. As growth proceeded the carbohydrates decreased everywhere, but most rapidly in the tips of shoots. The May 10 samples showed, however, a significant increase in carbohydrates at the tips of shoots, especially those of the laterals. Applications of nitrate of soda decreased the carbohydrates, especially in the laterals. Heading decreased the amount of starch and sugar in the cut ends of the shoots, but did not materially affect the carbohydrate content of the 2-year-old wood.

Variations in total nitrogen, presented both in tabular and diagrammatic form, show the highest content, 1.95 per cent, in May 10 samples of new growth on the leaders of unpruned, nitrated trees, and the lowest content, 0.26 per cent, in samples taken on the same date of tips of 2-year-old wood of headed trees. With the commencement of growth, the nitrogen content increased at the tips and decreased in 2-year-old wood. Although applications of nitrate of soda greatly increased the nitrogen content of new growth and tips of 1-year-old wood, the nitrogen content of older wood of nitrated trees was less than that of unfertilized trees, evidencing a close parallelism with moisture distribution. Heading induced a rapid increase in the amount of nitrogen at the cut ends and lowered the nitrogen content of 2-year-old wood. The nitrogen content of new growth from pruned shoots was higher than that of unpruned trees. With one exception the middle portions of the 1-year wood, as shown in April 17 samples, contained more nitrogen than did similar portions from control trees.

In general conclusion the author points out that the results of the study support the customary practices in pruning. Severe pruning, such as heading, apparently stimulates the rapid use of carbohydrates essential to fruit-bud formation, and hence this type of pruning should be avoided with the approach of bearing age.

Some mistakes in orcharding, C. E. THORNE (*Ohio Sta. Mo. Bul., 10 (1925), No. 1-2, pp. 17-20, figs. 2*).—This is a discussion of experiences gained in developing a commercial apple orchard, the author pointing out certain mistakes in the choice of varieties, selection of fillers, etc. A comparison of Gano apples and peaches as filler trees was to the advantage of the latter, the peaches not only paying the expenses of the apple trees up to their time of maturity, but also dying out before crowding the permanent trees. It is suggested that an apple filler in the center of each square would increase production in the interim between the death of the peach fillers and the crowding of the permanent trees.

Additional records of self-sterility in apples, C. S. CRANDALL (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 63-67*).—Self-pollination tests with 34 orchard varieties of apples showed 25 to be self-sterile. Of the 25, the Rome and Fanny each produced one seedless fruit. The 9 fertile varieties yielded an average of 3.6 seeds per fruit. Working with 43 crablike forms of apple, the author found 16 to be self-sterile to the extent of producing no fruit. The seed content of the fruits produced on the self-fertile trees averaged 2.66. The resulting seedlings from the crablike forms were generally of low vitality, and the mortality losses approached 77 per cent as compared with 54 for seedlings of orchard varieties. In 61 hybrids produced between orchard varieties and species, 24 failed to set any fruit, 3 bore fruits with no viable seeds, and 1 produced a single seedling too weak to survive. The Tolman × *Malus atrosanguinea* seedling yielded no fruits from 8 self-pollination tests.

Grafting in the apple orchard, H. A. CARDINELL and F. C. BRADFORD (*Michigan Sta. Spec. Bul. 142 (1925), pp. 3-39, figs. 29*).—The technique of apple grafting is discussed in detail, the various operations being illustrated with photographs and drawings.

Fertilizing young apple orchards, F. H. BALLOU (*Ohio Sta. Mo. Bul., 10 (1925), No. 1-2, pp. 14-16*).—Yield records, covering the three years 1922-1924, in young orchards located on the Clermont and Hamilton County experimental farms show that nitrogen-bearing fertilizers have been distinctly beneficial, especially on the poor quality soil of the Clermont farm. Here, based on three-year records, the nitrated trees averaged 221.4 and 219.4 lbs. per tree per year, respectively, in the grass mulch and tillage cover-crop areas, as compared with 86.7 and 80.8 lbs. for the control trees. In the Hamilton County orchard, located on a fertile soil, nitrogen fertilizers showed some benefit on the grass mulch plats, but none on the tilled cover-crop area. In the Clermont orchard grass mulched trees averaged 186.5 lbs. and tillage cover-crop trees 196.4 lbs. of fruit per tree, while in the Hamilton County orchard the yields were 129.9 and 160.3 lbs., respectively. In the Clermont orchard sulfate of ammonia gave larger yields than did nitrate of soda, while in the Hamilton County orchard the situation was reversed, leading to the general deduction that the two materials are equally effective in providing nitrogen in a quickly available form.

Pollen abortion in the peach, H. E. KNOWLTON (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 67-69*).—A brief report upon pollen studies conducted at the West Virginia Experiment Station. As anticipated from the work of Connors (E. S. R., 48, p. 837), no normal pollen grains were found in the J. H. Hale

variety either in 1923 or in 1924. The discovery of an almost similar status in the Late Crawford in 1923 was quite unexpected and is believed by the author to explain the light sets of fruit which often occur in this variety. A count of from 5 to 10 per cent of aborted pollen in the Rochester, Elberta, and Belle varieties in 1923 is deemed an insufficient quantity to interfere with successful pollination.

In a study of the time and stage of development at which pollen abortion occurs in the J. H. Hale variety it was found that irregularities take place as early as January 1 in many of the tetraspores. Following liberation, abortion in the young microspores was much more frequent and continued until the anthers dehisced. Contrary to the behavior of normal microspores following their liberation from the tetrad, those of this variety failed to grow to any extent, to thicken their walls, or to undergo subdivision.

Attempts to modify sterility in the J. H. Hale variety by heavy fertilization with nitrate of soda or acid phosphate yielded negative results, leading the author to conclude that pollen sterility is probably an inherent morphological character. In numerous counts made at the equatorial plate stage of the first reduction division of pollen mother cells of this variety the author found eight haploid chromosomes, which he suggests is the probable number for the peach.

The dry-mix spray for peaches, F. J. SCHNEIDERHAN and R. H. HURT (*Virginia Sta. Bul. 239 (1925), pp. 16, figs. 3*).—Comparative tests in 1923 and 1924 of the so-called dry-mix summer spray (E. S. R., 49, p. 349) with the self-boiled lime sulphur as a protective medium for peaches showed the former to give slightly better control of scab and brown rot. When the same amounts of lead arsenate were added to both sprays the dry mix gave better curculio control in 1923 and equally good control in 1924. In ease of preparation, in adaptability for storage, and in freedom from clogging sediment, the dry mix was found to be distinctly superior. Information is presented on the cost, preparation, and use of the dry-mix material.

Profitable pruning for the Concord grape, N. L. PARTRIDGE (*Michigan Sta. Spec. Bul. 141 (1925), pp. 12, figs. 9*).—A presentation of general information on pruning and training the Concord grape, based largely on investigations the results of which have been in part previously noted (E. S. R., 49, p. 237).

Grape experiments at the South Mississippi Experiment Station, W. S. ANDERSON (*Mississippi Sta. Circ. 59 (1924), pp. 6*).—A test, reported in tabular form, of a large number of grape varieties of several different groups, including the Munson hybrids, northern bunch varieties, and the muscadines, showed that this fruit is well suited to south Mississippi. For example, the Concord variety yielded an average of 8,852 lbs. per acre. Several vinifera varieties grafted on resistant American roots made fair growth and yielded some fruit, the Muscat Hamburg doing particularly well.

The gardener, L. H. BAILEY (*New York: Macmillan Co., 1925, pp. XII+260, pls. 16, figs. 15*).—Arranged alphabetically according to plant material, this guide presents brief practical information on the cultivation of common garden plants, flowers, and fruits.

Big crops from little gardens, A. B. ROSS (*New York: Minton, Balch & Co., 1925, pp. X+254, pls. 12, figs. 16*).—A general guide to the growing of vegetable plants, paying particular attention to culture, fertilizers, garden arrangement, etc.

The culture of bulbs, J. L. COTTER (*London: Hutchinson & Co., [1924], pp. XIII+15–192, pls. 47, figs. 8*).—A comprehensive discussion upon the culture, propagation, and care of bulbous plants, including narcissus, tulips, tuberous rooted begonias, iris, gladioli, lilies, etc.

Ornamental trees and shrubs, S. Mottet (*Les Arbres et les Arbustes d'Ornement de Pleine Terre. Paris: J.-B. Baillière & Son, 1925, pp. XII+576, pls. 40, figs.* [*240*]).—Devoted for the greater part to descriptions of the principal genera, species, and varieties of ornamental trees and shrubs, this book includes a chapter on propagation, pruning, planting, and wound repairing, and lists of shrubs and trees adapted to special environments.

Self-sterility in rhododendrons, H. F. Comber (*Gard. Chron., 3. ser., 77* (*1925*), *No. 2001, pp. 300, 301, figs. 6*).—Studies carried on at the Royal Botanic Garden, Edinburgh, Scotland, showed a gradation from total sterility in some individuals of certain species such as *Rhododendron arboreum*, *R. decorum*, and *R. maddenii*, through intermediates such as *R. argenteum*, *R. hodgsonii*, and *R. lochmium*, to normally self-pollinating species such as *R. camelliaeflorum*, in which every flower is succeeded by a full seed capsule. Fruiting capacities of individual plants were found to vary according to the age, soil, temperature, and atmospheric conditions. Even in naturally self-fertile plants tests showed that cross-pollination was beneficial in promoting seed production.

The American rose annual, 1925, edited by J. H. McFarland (*Harrisburg, Pa.: Amer. Rose Soc., 1925, pp. 208, pls. 19, figs. 12*).—This, the tenth edition (E. S. R., 51, p. 346), contains short articles of universal interest relating to rose breeding, culture, protection, and new varieties introduced during the year 1924.

FORESTRY

Common forest trees of Arkansas: How to know them, J. T. Buchholz and W. R. Mattoon (*Ark. Agr. Col. Ext. Circ. 180* (*1924*), *pp. 84, figs. 82*).—In line with previously noted publications (E. S. R., 50, p. 543), this handbook contains illustrated descriptions of trees native to Arkansas, serving as a guide to their identification.

A key to the identification of some coniferous seedlings, C. G. Bates (*Jour. Forestry, 23* (*1925*), *No. 3, pp. 278–281, figs. 11*).—With the aid of drawings, the author outlines the principal characteristics of the seedlings of some of the more important Rocky Mountain and northeastern species of conifers. Ability to resist heat at the ground surface was noticed to be correlated in the western yellow and the piñon pine with a red coloration of the stem. However, the jack and lodgepole pines, both heat-resistant species, were lacking in this red color, thus preventing the drawing of any generalization.

Gathering and extracting red pine seed, A. H. Richardson (*Jour. Forestry, 23* (*1925*), *No. 3, pp. 304–310*).—In a study of various factors concerned in the procuring of high-grade red pine seed no appreciable differences were found to exist in the viability of seeds gathered at different times or whether the cones were cured out or in doors. However, because of the freedom from weather variations, indoor curing is deemed more satisfactory. It is much more rapid, only 10 hours being required with the equipment utilized in the study. No significant difference was found in the viability of seed which separated from the cones of its own accord and that which was extracted. Although it is known that red pine seed can endure a temperature of from 150 to 160° F. during extraction, 130° was found much more economical and quite as satisfactory. In the 10-hour process at 130° the last seed extracted did not differ appreciably in viability from the first, both lots approaching the general average of 87.12 per cent viability based on the germination counts of 87 lots of 100 seeds each.

Some ratios of form in Adirondack swamp spruce, H. C. Belyea (*Jour. Forestry, 23* (*1925*), *No. 1, pp. 43–48*).—In a preliminary study of the form and

taper of swamp spruce growing in the western Adirondack area, the author found that both form quotient values and form factor values vary inversely with increases in height and diameter, and that the greater the diameter the greater the relative length of the crown. Furthermore, the taller the tree the greater is the relative length of the crown. Trees with relatively long crowns apparently develop more rapid taper and show lower form ratios. It is believed that a short stem with a high form quotient or form factor indicates a relatively small crown, a relatively high crown, a large proportion of clear length, and a very rapid decrease in diameter or taper once the bole has entered the crown itself. Tall trees with rather low form quotient and form factor values apparently indicate long, low crowns, a small amount of clear length, and rather easy but consistent taper of the bole within the crown. Thus it becomes evident that thrifty, vigorous, and relatively fast-growing trees are more conical in their tree form.

A study in comparative lengths of tracheids of red spruce grown under free and suppressed conditions, W. B. MacMillan (*Jour. Forestry, 23 (1925), No. 1, pp. 34–42*).—A study of measurements of the length of tracheids of free and suppressed red spruce obtained from various States and from the Province of Quebec showed a higher percentage of short-length fibers in the suppressed trees and, conversely, a higher percentage of long fibers in the free-growing trees. A tendency was noted for the tracheids to elongate from the pith outward toward the bark. No correlation was found between the length of tracheids and the geographical source of the original material. The author is unable to assign any definite cause for the variation in length of tracheids from free and suppressed trees.

Artificial reproduction of California nutmeg (Torreya californica Tor.; Tumion californicum Greene), W. Metcalf (*Jour. Forestry, 23 (1925), No. 1, pp. 62–70*).—Data are presented upon the size and weight of seed, loss of moisture in storage, the effect of storage upon vitality, the manner and rate of germination, growth in the seed bed, the presence of albino forms, the methods and costs of establishing plantations, etc. A portion of the work has been noted from another source (E. S. R., 48, p. 540).

Practical forest management, compiled by C. G. Trevor and E. A. Smythies (*Allahabad, United Provs.: Govt., 1923, pp. XVIII+220+LXVIII, pls. 18*).—Prepared with the object of placing on record, for the benefit of trained foresters, the details of forest management and working plan procedure as at present adapted in the United Provinces, this book deals chiefly with sal, chir, and deodar, the most important species of northern India.

Schlich's manual of forestry.—III, Forest management, including mensuration and valuation, W. Schlich (*London: Bradbury, Agnew & Co., Ltd., 1925, vol. 3, 5. ed., rev., pp. VIII+383, pls. 3, figs. 65*).—A revised and for the greater part rewritten edition (E. S. R., 25, p. 448).

Forestry research in Belgium, A. Poskin (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 4, pp. 814–821*).—The author discusses the development and present status of forestry research in Belgium, where, because of the relatively small area, 17.7 per cent of the total being devoted to forests, it is highly essential that intensive forestry practices be utilized.

Nineteenth and twentieth annual reports, division of forestry, for the period commencing November 1, 1922, and ending November 30, 1924, F. E. Pape (*Wash. State Forestry Div. Ann. Rpts., 19–20 (1923–24), pp. 51, pls. 4, figs. 8*).—In this biennial report (E. S. R., 49, p. 142), particular attention is paid to the subject of fire protection, a matter which was rendered especially important because of the hazard incident to the Olympic windfall.

Annual report on the forest administration of Nigeria for the year 1923, H. N. THOMPSON (*Nigeria Forest Admin. Ann. Rpt. 1923, pp. 18*).—This is the usual administrative report (E. S. R., 51, p. 347).

DISEASES OF PLANTS

Plant diseases [California], D. G. MILBRATH (*Calif. Dept. Agr. Mo. Bul., 12 (1923), No. 7–12, pp. 364, 365*).—The climatic conditions of the year were such that many plant diseases commonly occurring became epidemic and those ordinarily sporadic produced more injury than usual. Among these are mentioned plane tree mildew (*Uncinula salicis*), balm of Gilead canker (*Cytospora chrysosperma*), boxwood stem rot (*Phoma* sp.), palm bud rot (*Penicillium roseum*), chestnut canker (*Fusicoccum* sp.), sycamore anthracnose (*Gnomonia veneta*), pecan rosette, Colocasia corm rot (*Fusarium* sp.), celery mosaic, eggplant root rot (*Sclerotinia* sp.), cucumber downy mildew (*Peronoplasmopara cubensis*), cucumber angular leaf spot (*Bacterium lachrymans*), apple rust (*Gymnosporangium juniperi-virginianae*), peach rust (*Puccinia pruni-spinosae*), and grape rust (*Physopella vitis*). Other diseases regarding which requests for assistance were received from a large number of counties were grape mildew (*U. spiralis*), apricot shot hole (*Coryneum beijerinckii*), blackberry blue stem (*Verticillium caulophagus*), pear blight (*Bacillus amylovorus*), bacterial pea blight (*Pseudomonas pisi*), and peach brown rot (*Monilia fructigena*).

Virus diseases of plants, F. T. BROOKS (*Nature [London], 112 (1923), No. 2826, p. 955*).—In a discussion held during the meeting of the British Association at Liverpool results of research or views were contributed by P. Murphy, H. M. Quanjer, W. B. Brierley, T. Whitehead, H. Smith, and R. N. Salaman. These contributions are briefly indicated.

Methods of controlling diseases and parasites.—II, Seed treatment [trans. title], E. VOGT (*Centbl. Bakt. [etc.], 2. Abt., 59 (1923), No. 1–4, pp. 55–79*).—In contrast with the first section of this contribution (E. S. R., 52, p. 148), the present section presents the theory, methodology, chemistry, and mode of action of pickling solutions, with dust, gas, hot water, and combined treatments, also afterinfection and other problems.

The problem of the operation of poison in plant protection research [trans. title], E. JANISCH (*Centbl. Bakt. [etc.], 2. Abt., 61 (1924), No. 1–4, pp. 10–32*).—This is a contribution to systematically applied cytology as regards the actual happenings in connection with the employment of poisons against plant diseases, including also a bibliography of the subject.

The significance of the haustoria of Arceuthobium [trans. title], H. HEIL (*Centbl. Bakt. [etc.], 2. Abt., 59 (1923), No. 1–4, pp. 26–55, figs. 21*).—Dried or alcoholic material brought from Mexico in 1908 was studied as to intimate relations of the host and parasite (*A. abietis religiosae*), both technique and data being detailed herein.

The biology of Armillaria mellea [trans. title], J. DUFRÉNOY (*Bul. Soc. Path. Vég. France, 9 (1922), No. 4, pp. 277–281, figs. 2*).—This brief account of the cosmopolitan polyphagous fungus *A. mellea* refers to the published work of 10 contributors.

The biology of the Uredineae [trans. title], A. BUCHHEIM (*Centbl. Bakt. [etc.], 2. Abt., 60 (1924), No. 22–24, pp. 528–536, figs. 3*).—Details are given regarding inoculation and resulting failure or success as regards infection in case of *Uromyces primulae* and in case of *U. pisi* on several species of Lathyrus.

Fusarium blight of the cereal crops, D. ATANASOFF (*Meded. Landbouwhoogesch. [Wageningen], 27 (1923), No. 4, pp. 132, pls. 6, fig. 1*).—The data here

presented result from studies during six years on Fusarium blight of cereal crops, part of these results having been previously noted (E. S. R., 44, p. 248). The present monographic account is, however, based more largely upon subsequent studies and observations made at various places in Europe. An important aim of this contribution is to emphasize the intimate interrelations or the identity of the various injuries of cereal crops due to *Fusarium* spp., the symptoms and pathologic effects being identical, it is said, in all cases, in all countries, and under all conditions. Separation of this disease into seedling blight, snow mold, foot rot, stalk rot, and head blight (wheat scab), as has been done heretofore, is no longer permissible, unless these forms are understood to be different stages of the same disease. The relations of these phases of this trouble are detailed, as are also its geography, importance, literature, and causal organisms, with their forms, synonymy, life history, pathogenicity, and relation to climate, varieties, and cultural conditions. Control measures require the simultaneous employment of several methods indicated.

The longer and more detailed account is in English. A shorter account in Dutch follows an extended bibliography, and this account also lists the organisms, regarded as causal, to include *Gibberella saubinetii*, *Calonectria graminicola*, *F. culmorum*, *F. culmorum leteius*, *F. avenaceum*, *F. herbarum*, *F. arcuosporum*, *F. scirpi*, *F. redolens*, *F. solani*, and *F. arthrosporioides*.

The development of Rhizoctonia on alfalfa [trans. title], V. DUCOMET (*Bul. Soc. Path. Vég. France, 9 (1922), No. 4, pp. 312–316*).—According to the results of studies during several years, Rhizoctonia appears to be a parasite favored by dry weather and capable of doing more harm to alfalfa in dry than in moist years. This fact is apparently related to the greater power of resistance of plants well supplied with water, as evidenced by the comparative security of plants deeply rooted or rooted in deep fissures of rock.

Wire stem of cabbage, L. O. GRATZ (*New York Cornell Sta. Mem. 85 (1925), pp. 3–60, pls. 7, figs. 15*).—Cabbage wire stem is here dealt with principally as one of the factors tending to cause disadvantageous delay in the production, in good condition on the market, of early spring cabbage; this name being proposed for the second stage or condition of such plants as live through and may partly or wholly recover from the damping-off stage of disease induced by *Corticium vagum*, considered by Duggar (E. S. R., 34, p. 840; 36, p. 145) as identical with *Rhizoctonia solani* and dealt with, as regards its specialization, by Matsumoto (E. S. R. 46, p. 325).

The strain of *C. vagum* causing cabbage wire stem is considered as physiologically distinct from the strains causing lesions on potato stems, none of these being found pathogenic to cabbage, and the cabbage strain not being proved pathogenic on potato stems. The minimum and maximum growth temperatures of this fungus lie near 9 and 31° C., respectively, the imperfectly defined optimum lying between 22 and 26°. The pH range for growth of this fungus is wide, extending from approximately 2 to above 10.4°, the optimum being about 6.2°. Practically any soil temperature and moisture combination favorable to the growth of cabbage also favors growth of the fungus and development in surviving plants of the wire stem condition, so that the disease can not be controlled through environmental conditions.

A disease of cotton [trans. title], H. A. TAVARES (*Bol. Agr. [Sao Paulo], 24. ser., No. 3–4 (1923), pp. 101–109*).—The wilt of cotton due to *Fusarium vasinfectum* is noted as to symptoms, effects, injury caused, and prevention by means of rotation and use of cotton varieties mentioned as more or less resistant to the organism.

Onion smut and its control [trans. title], ZILLIG (*Centbl. Bakt. [etc.], 2. Abt., 60 (1923), No. 1–6, pp. 50–58, figs. 2*).—Onion smut, *Urocystis* (*Tuburcinia*)

cepulae, said to have been recognized first in the United States about 1880 and in Europe during the seventies, and to constitute at the time of writing the most destructive onion disease in British North America, is discussed as to its biology, perpetuation, and control. It gets into the soil in the form of spores or mycelium with buried onion refuse or leavings; finding there organic nutriment, it lives and probably grows in a saprophytic state or stage which is encouraged by the presence of fertilizer, as stable manure. Mycelium capable of causing reinfection under glass may persist in the soil for an unknown number of years. The incubation period, the time intervening between infection and spore formation which is described, is about five days under glass. Several problems still unsolved are indicated.

Why potatoes run out, E. S. Schultz (*U. S. Dept. Agr., Farmers' Bul. 1436 (1924), pp. II+21, figs. 14*).—Consideration in condensed form is given to what is known regarding potato so-called virus or degeneration diseases, including now mosaic, leaf roll, spindle tuber, streak, curly dwarf, combinations of these, causal agencies, symptoms, dissemination, and methods of control.

Relation of germinability of potato tubers to soundness and yield [trans. title], Schander and Richter (*Centbl. Bakt.* [etc.], *2. Abt., 60 (1923), No. 1–6, pp. 27–50, figs. 8*).—A study of potato plants and yields derived from tubers more or less affected with different diseases shows a direct and close relationship between the germinability of the seed tubers and the yield of the plants developed therefrom. The number of sprouts is larger on the larger tubers. Plants showing leaf roll invariably prove to have been derived from tubers showing proportionately low germinability. The same sort of association, as regards lowering of germinability and disease, is noted in case of the phenomena of mosaic and crinkle. *Rhizoctonia* (*Hypochnus*) *solani* causes a disturbance and weakening of the seed tubers, resulting in a lowering of germinability, though such lowering does not usually result noticeably from scurfiness or from fungus and bacterial attack. Tubers of lowered germinability always fall below the average in yield.

Premature desiccation of potato plants in the Loire [trans. title], C. Perret (*Bul. Soc. Path. Vég. France, 9 (1922), No. 4, pp. 257–259*).—A drying-out of potato plants is described as observed to occur after blooming. The trouble may be related to altitude and accompanying differences in humidity.

The problem of potato storage in western India, S. L. Ajrekar (*Agr. Jour. India, 19 (1924), No. 1, pp. 35–44*).—Study of potato storage rots has been carried on at the Poona Agricultural College since 1917. The author here discusses the main conclusions reached as bearing on potato storage in western India, the detailed conclusions being reserved for separate publication. Some results related to this work have been reported by Mann and others (E. S. R., 50, p. 147).

Studies by the present author during recent years are considered to show that potato storage rots, as distinct from moth trouble, may be divided into dry rots due to fungi and wet rots caused by bacteria.

Of the fungi found, four cause rots, two species of Fusarium (not fully identified), and two species of Sclerotium, namely, *S. rolfsii* and *Sclerotium* sp., formerly known as *Rhizoctonia destruens* and *R. solani*, respectively. Each produces a characteristic dry rot, but this may be altered as to apparent characters by bacterial invasion. All four appear as wound fungi ordinarily, though they may also enter by way of lenticels or near eyes. All four grow fairly well between 77 and 95° F., though they show different optima.

The wet bacterial rots appear to be due to common soil organisms acting under certain favorable conditions of moisture and of temperature, the opti-

mum of the latter for potato bacterial disease production being about 86 to 104°.

The heat rot described by Mann and Nagpurkar is said to be only a form of bacterial wet rot. The symptoms of heat rot are distinct from those of blackheart.

There is reason to suppose that continued heat, as 104°, may eventually kill the eyes and tissues of tubers, and thus condition attacks by organisms ordinarily saprophytic, some of which are known to become pathogenic around 95°. In this sense, heat may be considered as a primary cause of potato rots, though it is regarded as unlikely that physical heat alone causes potato rots primarily in western India.

The bearings of the above conclusions are indicated, as are also further experiments regarded as desirable in this connection.

Potato diseases in Dutch East Indies [trans. title], E. PARAVICINI (*Centbl. Bakt.* [*etc.*], *2. Abt., 58 (1923), No. 9–12, pp. 212–220*).—The increasingly important potato industry in the Dutch East Indies is impaired and threatened more seriously by mosaic than by any other disease, leaf roll ranking second in this respect. Diseases briefly discussed include also those connected with *Alternaria solani*, *Phytophthora infestans*, *Bacterium solanacearum*, *Fusarium* spp., *Actinomyces* sp., and a few physiological failures, as rust spot.

The biology of potato anthracnose [trans. title], R. AVERNA-SACCÁ (*Bol. Agr.* [*Sao Paulo*], *24. ser., No. 7–8 (1923), pp. 272–282, figs. 7*).—A descriptive account is given of potato anthracnose, associated with the ascophore form, described as *Plowrightia solanicola* n. sp., of the fungus (*Colletotrichum solanicolum*, *Cytosporina* sp., *Phoma solanicola*) causing anthracnose of potato plants, which are affected more severely in moist soils.

Potato spraying and dusting in 1924, P. E. TILFORD (*Ohio Sta. Mo. Bul., 10 (1925), No. 1–2, pp. 20–22*).—Lead arsenate was added to a copper-lime dust (19 per cent monohydrated copper sulfate) applied with a hand duster, and to Bordeaux mixtures 2–2–50 and 4–4–50 applied with a 3-nozzle power sprayer in four sprayings two to three weeks apart from late June to the middle of August. The dust was used at the rate of 20 to 25 lbs. and the Bordeaux mixture at 100 gal. per acre for each application.

The potatoes, which had been planted May 10, developed no late blight and no significant amount of early blight, but the check plats showed severe hopperburn (55 to 60 per cent) by the first of September, the beneficial effects being evidently due to control of hopperburn and to the stimulating effects of the treatments.

The copper-lime dust gave a gain over the controls of 43.4 bu. per acre. The 4-treatment 2–2–50 Bordeaux mixture showed a gain of 60.9 bu. and 4–4–50 Bordeaux 105.8 bu. Some plats which were sprayed five times (the last on September 5) with 4–4–50 Bordeaux gained 98.6 bu. per acre.

Dust treatments are regarded as constituting justifiable practice, at least in case of limited acreage not warranting power sprayers. Copper sprays of at least 4–4–50 strength in four treatments or more, in years of epidemic late blight, are thought to constitute better practice in case of larger acreages.

The finding of resting spores of the potato canker organism (Chrysophlyctis endobiotica) in earth adherent to the tubers [trans. title], SCHANDER and RICHTER (*Centbl. Bakt.* [*etc.*], *2. Abt., 58 (1923), No. 19–24, pp. 454–461*).—Facts and suggestions are presented bearing upon the prevention of reinfection of potato crops on or near ground previously infected with potato black wart.

The relations of the potato canker organism to its host [trans. title], E. KÖHLER (*Centbl. Bakt.* [*etc.*], *2. Abt., 61 (1924), No. 1–4, pp. 42–57*).—Attempts

are made to distinguish as to differences in susceptibility to canker (*Synchytrium endobioticum*) between potato varieties and between the various parts of the plant, especially among subterranean portions, including tubers. Susceptibility in a variety appears to be dependent at least partly upon the mass of material in the subterranean shoot system. Differences in the production of such material produce differences in susceptibility or in tumor growth, which may be striking in varieties near the border line as to susceptibility and immunity. This explains also differences, sometimes striking, between individual plants within a variety as regards apparent susceptibility, which in such instances are due (according to this view) to external causes influencing the amount of material favoring wart development.

Seedling beet rot in Italy [trans. title], G. CAMPANILE (*R. Staz. Patol. Veg. [Rome], Bol. Mens., 4 (1923), No. 4-6, pp. 39-47, fig. 1*).—Sugar beet plantlets on seed beds at the Rome Station for Vegetable Pathology showed, in 1923, a disease which proved to be due to *Phoma betae*.

***Aeginetia* sp., a root parasite of sugar cane** [trans. title], J. H. COERT (*Arch. Suikerindus. Nederland. Indië. Meded. Proefsta. Java-Suikerindus., 1924, No. 13, pp. 437-447, pls. 2, figs. 7; abs. in Facts About Sugar, 19 (1924), No. 18, p. 425*).—A brief historical, descriptive, and geographical account is given of *Aeginetia* sp. as a sugar cane root parasite, with mention of similar relations of *A. indica* in the Philippines as observed by Hines (E. S. R., 45, p. 51).

The causation of matizado [trans. title], M. T. COOK (*Rev. Agr. Puerto Rico, 13 (1924), No. 6, pp. 373-376*).—Sugar cane matizado (mottling) is discussed briefly as regards each of seven forms of alleged origin or causation, namely, soil, virus, enzyme, physiological, protozoal, bacterial, or variational.

Sugar cane mosaic [trans. title], S. C. BRUNER (*Indus. Azucarera, 29 (1924), No. 366, pp. 228-237, figs. 5*).—An account is given, with discussion, of sugar cane mosaic as regards its history, distribution, causation, recognition, effects, hosts, propagation, and control, for which legislation is outlined.

Mosaic disease eradication campaign [South Africa] (*So. African Sugar Jour., 8 (1924), No. 7, pp. 523, 525*).—Uba is said to be the only cane variety grown in Natal that does not show mosaic, and it is thought that the planting of other canes may soon bo proclaimed as illegal.

The influence of streak disease upon the yield of Uba cane, H. H. STOREY (*So. African Sugar Jour., 8 (1924), No. 7, pp. 519-521, 523, figs. 2; abs. in Facts About Sugar, 19 (1924), No. 18, p. 425*).—It is thought probable that streak disease in Uba cane will produce less damage in wet than in dry seasons. Directions for practice in a slightly or a highly infected region are given, but only by planting healthy seed can a healthy cane crop be obtained. The loss may range as high as 30 or even 50 per cent. The only remedial measure of promise in case of infected fields is thorough roguing.

Serious nature of cane diseases (*So. African Sugar Jour., 8 (1924), No. 7, p. 535*).—A gumming disease has broken out in the sugar cane fields on the Tweed in Queensland. An acconnt is given of recent losses on the Richmond River.

Spraying early apples for blotch control, J. A. MCCLINTOCK and C. D. SHERBAKOFF (*Tennessee Sta. Bul. 132 (1925), pp. 8, figs. 2*).—In the spring of 1923 spray tests were undertaken to determine whether the varied and often poor results obtained in following the spray schedule recommended for this State were due to an incorrect schedule or to lack of thoroughness in application. These tests were located in four commercial orchards in Williamson and Maury Counties. In the test blocks a special schedule was followed, differing from the regular one in that a 3-4-50 Bordeaux mixture was used in place of lime sulphur for the calyx spray, and differing also in that the subse-

quent applications were made one week earlier than prescribed in the approved schedule.

From the results of tests during 1923 and 1924, as tabulated with brief discussion, no conclusion was reached favorable to a change in the present schedule so far as regards the use of Bordeaux mixture in practical substitution for lime sulphur as a calyx spray. Results from 2-4-50 Bordeaux mixture in 1924, as compared with those from 3-4-50 and 4-5-50 in 1923, indicate that the weaker is as effective in disease control and preferable as regards Bordeaux injury. The importance of thoroughness in spraying is indicated, the majority opinion of the growers in whose orchards these tests were made considering thoroughness in application more important than materials used.

It is recommended that for blotch control on early apples at least four summer sprays be applied, starting with the calyx spray and following at intervals of two weeks. If scab is serious, a pink bud spray with lime sulphur should precede the calyx or first blotch spray. Either lime sulphur or Bordeaux, if thoroughly applied, should control blotch. A caseinate of lime spreader, if added to the spray, probably conduces to thoroughness of application to the surfaces.

Comparison of materials used in spraying and dusting for apple scab control in Pennsylvania, H. W. Thurston, Jr., R. C. Walton, and F. N. Fagan (*Pennsylvania Sta. Bul. 190 (1924), pp. 20, figs. 5*).—During six years experimentation has been carried on in 26 commercial orchards in Adams County, in experiment station orchards in Center County, in one orchard in Franklin County, and in one in Chester County. Eighteen different materials were used with 9 varieties on 200 separate plats and with 111 different combinations as to materials and times of application. Lime sulfur was used at sp. gr. 1.03 for delayed dormant applications and at 1.01 or 1.008 for all other applications. All sprays were applied with power machinery under pressures ranging from near 250 lbs. to above 300 lbs. per square inch. Dusting was also done with power machinery and when the wind was low.

Though the delayed dormant and the prepink application may not both be necessary in some years (depending upon rainfall), it is considered best as a general practice to follow the spray schedule as outlined, including the delayed dormant, prepink, pink, petal fall, 10-day, 4-5 weeks, and 9-10 weeks sprays. The necessity for at least one application (usually at the time of the delayed dormant) prior to the pink, almost every year, is strongly emphasized. If after blooming no scab is present, even in the tops of the trees where it frequently escapes observation, then the 4-5 weeks and the 9-10 weeks sprays may safely be omitted.

Of all the materials tested, lime sulfur is preferred, whether homemade or commercial, if properly applied at proper strengths. It should be used at 1.03 for delayed dormant applications and at 1.008 for all subsequent applications, these strengths to be determined strictly by use of the hydrometer. Dry lime sulfur as used at State College on very susceptible varieties gave satisfactory control of scab, particularly in 1924, with much less foliage burning and fruit russeting than did commercial liquid lime sulfur, and fully as good control. Precipitated sulfur, as furnished by the Crop Protection Institute, gave promising results in Chester and in Adams Counties during 1924, scab control being excellent and foliage burning and fruit russeting practically absent.

The work during six years involved many experiments with various dusts, sulfur dust, especially 90-10, 80-10-10, 85-15, and dust containing nicotine, having given some very promising results, and increasingly so with the use of the new and more powerful dusters, together with more finely divided dusts. Copper dusts never equaled sulfur dust mixtures. Pyrox, while effective in

one or two instances, never equaled lime sulfur. Bordeaux mixture was used twice in these experiments and there was no doubt in either instance as to its effectiveness in controlling scab, although its use has been quite generally discontinued for scab control on account of the russeting which it frequently causes.

Other fungicides mentioned are not considered important competitors with the above-mentioned materials in control of apple scab. Calcium caseinate used at various strengths in lime sulfur sprays did not increase the fungicidal values. These experiments have emphasized the fact that in a year of light scab, as 1920, when weather conditions made control easy, almost any spray will keep the disease in check, but in a year of heavy infection or unfavorable weather, as 1922 or 1924, many spray materials fail even when applied often enough to keep the foliage covered.

Bud-rot of coconuts caused by Phytophthora palmivora, [S. SUNDARARAMAN] (*Agr. Jour. India, 19 (1924), No. 1, pp. 84, 85*).—Investigation by the author more recent than that basing statements, in a report by himself with Shaw as previously noted (E. S. R., 32, p. 149), which were questioned by Sharples and Lambourne (E. S. R., 48, p. 849), is stated to prove that *P. palmivora* can produce typical but rot on mature as well as on young coconut palms.

The diseases of the tea bush, T. PETCH (*London: Macmillan & Co., Ltd., 1923, pp. XII+220, pls. 3, figs. 69; abs. in Nature [London], 112 (1923), No. 2809, p. 322*).—The present work has been written to enable tea planters to recognize and control tea diseases, of which many are listed, with discussion, according to the parts of the tea bush affected. A preliminary chapter on fungi in general, which is included, is intended more as a running glossary than as a complete classification of the fungi. A chapter is devoted to wound covers, sprays, and sprayers, one to pertinent mycological notes, and one to concise descriptions of the causal organisms. A bibliography is appended.

The eelworm disease of phloxes, G. F. WILSON (*Jour. Roy. Hort. Soc., 49 (1924), No. 2, pp. 203–210, pls. 8; abs. in Gard. Chron., 3. ser., 76 (1924), No. 1968, p. 175*).—This disease of herbaceous perennial phloxes, known for years to be due to *Tylenchus devastatrix*, was investigated during and after 1921 to ascertain the exact methods of infection, the cause of its irregular appearance, and the relative susceptibility of varieties to the disease. This, though the only disease of importance affecting the herbaceous perennial phloxes, attacks severely both *Phlox decussata* and *P. suffruticosa*, in some places causing almost total loss.

This account deals with symptoms, life history of the parasite, effects of conditions, varietal susceptibility, infection experiments, susceptibility of other hosts, spread of the disease, and its avoidance. Neither phlox nor any other plant susceptible to *T. devastatrix* should be planted in soil known to contain this nematode.

Vermicularia herbarum parasitic on pink [trans. title], M. BALLINGS (*Bul. Soc. Path. Vég. France, 9 (1922), No. 4, pp. 288, 289, pls. 2*).—A disease of pink (*Dianthus caryophyllus*?) in gardens around Paris, not killing the plant but causing a drying-out of the lower leaves, is attributed to the presence of a Vermicularia, probably *V. herbarum*.

A new disease of sweet peas, W. J. DOWSON (*Jour. Roy. Hort. Soc., 49 (1924), No. 2, pp. 211–221, pls. 6*).—Sweet pea leaves showing mildewlike spots were noted and studied in 1922 and 1923. The disease, due to *Cladosporium album* n. sp., affects both hothouse and outdoor plants. Parasitism was shown in experiments under glass. High temperature and moist atmosphere appear to be important factors in spreading the disease. Fine sulfur dust is said to be protective.

Die-back or twig blight of useful trees [trans. title], L. Savastano (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acireale, 7 (1923), pp. 89–176, pls. 6, figs. 4*).—Citing numerous other contributions on tree diseases (E. S. R., 23, p. 149), the author states that die-back or twig blight and related diseases affecting citrus, apricot, fig, walnut, and mulberry have recently spread in an alarming way and are causing much injury. They are dealt with in systematic detail in connection with suggested measures, operative and preventive, the latter including tree eugenics, the development of resistant varieties.

The dying out of young walnut in 1922 [trans. title], Gard (*Bul. Soc. Path. Vég. France, 9 (1922), No. 4, pp. 263–266*).—The conditions previously referred to (E. S. R., 46, p. 653) appear to have become intensified as regards a partial or total dying out, at least in the aerial parts, of a large proportion of young walnut trees, constituting a real disaster in certain regions. The alterations, both external and internal, are described.

Lichens and their action on the glass and leadings of church windows, E. Mellor (*Nature [London], 112 (1923), No. 2808, pp. 299, 300, figs. 4*).—Results of studies on church window glass dating back in some instances as early as the twelfth century are briefly outlined.

There is little reason to believe that the glass of any century is more frequently or gravely attacked by lichens. The amount of corrosion does not depend upon age of the glass, nor does it principally determine the duration of the window, as do the character and size of the leadings which hold more or less water in contact with the glass. The deterioration of the leadings is purely chemical.

The glass serves as a substratum for lichens (especially when water is retained near the leadings), and these plants both give up carbon dioxide and retain water containing carbon dioxide, which acts on the glass. The lichen flora of church windows is practically confined to the exterior surface. Twenty-three lichen species and varieties have been identified. One of these, *Ramalina polymorpha ligulata*, is fructaceous, and two, *Xanthoria parietina* and *X. parietina tumida*, are foliaceous. All the others are crustaceous, this form appearing best adapted to the environment.

Growth of lichens is favored by free air supply and by moisture, but can be prevented by regularly brushing and washing the windows. The life of a window depends very largely upon the frequency and adequacy of attention given to the leadings.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A synopsis of the vertebrate animals of Tasmania, C. E. Lord and H. H. Scott (*Hobart: Oldham, Beddome & Meredith, 1924, pp. [5]+340, pls. 41, figs. 116*).—Descriptions are given of all known Tasmanian vertebrates. The work includes a brief account of the aborigines of Tasmania (pp. 319–321), an outline table of geological succession as recognized in Tasmania, a glossary of terms, and indexes to common and scientific names.

The badger: Its habits and life history, H. M. Batten (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 6, pp. 572–577, pl. 1*).—This paper deals with the subject under the headings of breeding and young, winter sleep, sanitation, food, badgers are not lamb killers, use of badger earths by foxes, and the badger harmless to agriculture. It is pointed out that the safety of livestock is not imperiled by the badger, and in its relation to the hunting interests the presence of a few is indisputably beneficial.

Alpine life of the heather vole (Phenacomys olympicus), W. T. Shaw (*Jour. Mammal., 5 (1924), No. 1, pp. 12–15, pls. 3*).—This account is based upon

observations made by the author in Spray Park, Mount Rainier, where the vole in summer lives and rears its young among the heather (Cassiope and Phyllodoce) well up among the snow patches, even to the foot of the glaciers.

The migration of North American birds.—XXVI, Broad-tailed, rufous, and Allen's hummingbirds, compiled by H. C. Oberholser (*Bird Lore, 26 (1924), No. 6, pp. 398, 399*).—This is a continuation of the second series of papers on the subject (E. S. R., 46, p. 851).

The European starling in Ohio, S. G. Harry (*Ohio Sta. Mo. Bul., 10 (1925), No. 1–2, p. 31*).—The occurrence of the starling in Ashland, Richland, Gallia, Lorain, Mahoning, and Wayne Counties was observed during 1924. A recent account of its occurrence in North America, by Cooke, has been noted (E. S. R., 52, p. 749).

The food of Porto Rican lizards, G. N. Wolcott (*Jour. Dept. Agr. Porto Rico, 7 (1924 [i. e. 1923]), No. 4, pp. 5–37*).—The author presents the details of investigations of the food of lizards in Porto Rico. The results are considered to prove conclusively that they are of very considerable economic benefit to the agricultural industry of the island through preventing an enormous increase in numbers of some insects which are now regarded as only minor pests.

Studies on the blood of insects.—III, The coagulation and clotting of insect blood, R. A. Muttkowski (*Bul. Brooklyn Ent. Soc., 19 (1924), No. 4, pp. 128–144, figs. 18*).—This is a continuation of the studies previously noted (E. S. R., 51, p. 54).

Insect pests, E. T. Ellis (*London: George Allen & Unwin, Ltd., 1924, pp. 156*).—The four parts of this brief popular account deal with insect enemies of vegetables (pp. 27–74), of fruit (pp. 75–108), and of flowers (pp. 109–133), and with Colonial and Continental pests (pp. 137–141) and pests of forest trees (pp. 142–150). A list of 17 pests scheduled under the Destructive Insects and Pests Acts, notification of the presence of which must be given to the Ministry of Agriculture, with a fine for not doing so, is appended.

Destructive insects Mississippi is guarding against, C. Lyle (*Miss. State Plant Bd. Quart. Bul., 4 (1924), No. 2, pp. 1–30, figs. 24*).—Brief summaries of information are given of the pink bollworm, sweet-potato weevil, European corn borer, Japanese beetle, alfalfa weevil, Japanese camphor scale (*Pseudaonidia duplex* Ckll.), oriental peach moth, sugar-cane moth-borer (*Diatraea saccharalis crambidoides* Grt.), Mediterranean fruit-fly, gipsy moth, and brown-tail moth.

Montana insect pests for 1923 and 1924, being the twentieth report of the State entomologist of Montana, R. A. Cooley (*Montana Sta. Bul. 170 (1925), pp. 30, figs. 6*).—This report includes a summary of grasshopper experiences during 1923 and 1924. Beginning with 1920 and continuing to the present time, an outbreak of the lesser migratory grasshopper has been widespread in the State and very destructive. Maps are given showing the location and approximate size of areas seriously infested in 1922, 1923, and 1924.

During 1924 the presence of the Hessian fly was discovered in Richland, Roosevelt, Wibaux, and Dawson Counties in eastern Montana, where in some [illegible]s it took as high as 30 per cent of the crop. The lepidopteran *Epischnia [illegible]berella* Schaus was very abundant in Park and Sweet Grass Counties, [illegible]re, through its boring in the crown and stem, it has in some places become [illegible]considerable value in ridding ranches of the loco weed. Brief notes are [illegible]nted on the insect pests of the two years.

[illegible]st supplement to Insectae Portoricensis, G. N. Wolcott (*Jour. Dept. [illegible] Porto Rico, 7 (1924 [i. e. 1923]), No. 4, pp. 38–43*).—Additions to and cor[illegible]ions of the check list previously noted (E. S. R., 51, p. 659) are here given.

Preliminary report on the agricultural zoology of North Wales, C. L. Walton (*Bangor: Univ. Col. No. Wales, Dept. Agr.*, [*1924*], *pp. 28*).—This report gives brief accounts of some of the pests of livestock, field crops, stored products, root crops, truck crops, and fruits, respectively.

Prevention of insect attack on stored grain, W. W. Mackie (*California Sta. Circ. 282* (*1925*), *pp. 8, fig. 1*).—The author has found that copper carbonate dust applied at the rate of 2 oz. per bushel effectively protects wheat against insect attack. Observations at Davis of wheat seed thus treated showed no insect attack when stored from a few months to two years, while untreated seed in the same pile was literally reduced to bran by the attacks of the granary weevil, the confused flour beetle (*Tribolium confusum* Duv.), and the Angoumois grain-moth. It is pointed out that within a very few years copper carbonate dust has come into general use on the Pacific coast as a bunt preventive, and results at Davis are reported showing an increase in yield of 31 per cent over no treatment and 65 per cent over the bluestone-lime treatment. Several other beetles in this group are deemed likely to succumb to copper carbonate dust. A list is given of 18 references to the literature.

The action of some organic compounds when used as stomach poisons for caterpillars, E. Hargreaves (*Bul. Ent. Research, 15* (*1924*), *No. 1, pp. 51–56*).—This is a report of experiments commenced in 1919 and continued in 1920 and 1923, in which caterpillars of *Pieris rapae* L. and *Spilosoma lubricipeda* Esp. were used, with leaves of cabbage and lupine, respectively, for food. The details of the work are reported in tabular form.

Dinitrocresylates proved very toxic, all strengths used being deterrent and the ammonium ortho compound proving the most toxic, as was found by Jackson and Lefroy in their study of fly poisons (E. S. R., 37, p. 665). With the exception of these and of two barium salts, both related to naphthalene, all the metallic organic compounds tested were relatively innocuous. Naphthalene derivatives, particularly the naphthols, naphthylamine, and chloro- and nitronaphthalenes, gave a general toxic action much greater than that of naphthalene itself. There appear to be possibilities with chloro-o-cresol, monochlorophenanthrene, dinitrophenol, and dianisidine, or with some compounds related to them. Barium and calcium fluorides were highly toxic, and fluorspar showed possibilities for use as an insecticide.

Further studies of Derris as an insecticide, E. R. de Ong and L. T. W. White (*Jour. Econ. Ent., 17* (*1924*), *No. 4, pp. 499–501*).—The authors refer to insecticidal tests made by H. E. Woodworth with several species of Derris abundant in the Philippine Islands, and then to work at the California Experiment Station (E. S. R., 52, p. 59). Earlier reports of work with Derris have also been noted (E. S. R., 41, p. 661; 47, p. 53; 49, p. 152).

Destruction of grasshoppers and crickets, J. Bernès (*Destruction des Sauterelles et des Criquets. Paris: Libr. Agr. Maison Rustique, 1923, pp. 48, figs. 7*).—A small handbook on control measures.

Thysanoptera of N[orth] A[merica]: Additions and a correction, J. R. Watson (*Fla. Ent., 8* (*1924*), *No. 2, pp. 29, 30*).—The author records *Liothrips vaneeckei* Pr., a European thrips not previously recorded from this country, as infesting lily bulbs in Los Angeles County, Calif. See also a previous note (E. S. R., 50, p. 660).

A new Bregmatothrips (Thysanoptera) from England and Holland, J. R. Watson (*Ent. Mo. Mag., 3. ser., 10* (*1924*), *No. 119, pp. 253, 254*).—Under the name *B. iridis* n. sp. the author describes a thrips collected by inspectors of the Federal Horticultural Board at New York on Iris shipped from England and the Netherlands.

The biology, morphology, and control of Psyllia mali Schmidberger, W. H. BRITTAIN (*Thesis, Cornell Univ., Ithaca, N. Y., 1923, pts. 1, pp. 69, pls. 6, fig. 1; 2, pp.* [20], *pls. 6, fig. 1*).—The first part of this work, which deals with the control of the European apple sucker, officially known as the apple psylla, is reprinted from a bulletin previously noted (E. S. R., 49, p. 850), and the second part, on morphology and synonymy, has been taken from the Proceedings of the Acadian Entomological Society for 1922 (E. S. R., 50, p. 844). Lists of 11 and 44 references to the literature accompany the two parts.

Notes on the black citrus Aphis, C. B. SYMES (*Rhodesia Agr. Jour., 21 (1924), Nos. 5, pp. 612–626, pl. 1, figs. 5; 6, pp. 725–737, pl. 1, figs. 3*).—This is a report of studies of the life history of *A. tavaresi* Del G., a common and serious pest of citrus throughout Southern Rhodesia.

Further observations on the Coccidae of Egypt, W. J. HALL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 36 (1923), pp.* [2]+*1–61, pls. 12*).—In this report of studies made in continuation of those noted (E. S. R., 48, p. 553), the genus Osiraspis is erected. Descriptions are given of 31 additional forms collected in Egypt, bringing the number up to 87, of which 22 are described as new.

Sucking lice of jack rabbits, H. E. EWING (*Amer. Jour. Trop. Med., 4 (1924), No. 6, pp. 547–551*).—The rôle that the rabbit plays as a natural reservoir for tularaemia, now known to be well established in Utah and elsewhere, and the part played by ectoparasites in the transmission of this affection, have led to the study here reported.

Haemodipsus ventricosus (Denny), the common sucking louse of tame rabbits and of cottontails in the eastern part of the United States, is the only sucking louse previously reported from the jack rabbit, and it is this species that was used by Francis and Lake (E. S. R. 46, p. 152) in their demonstration of the method of transmission of tularaemia from rabbit to rabbit. Under the name *H. setoni*, the author describes a new species collected from the jack rabbit near Wichita, Kans., and in San Diego County, Calif. Mention is also made of instances of the occurrence on the rabbit of the common sucking louse of the dog, *Linognathus piliferus* (Burm.).

Butterflies of India, C. B. ANTRAM (*Calcutta: Thacker, Spink & Co., 1924, pp. XVI+226, pl. 1, figs. 418*).—This work describes and illustrates the butterflies of India, 512 in number.

Panolis flammea Schiff and its parasites found in Poland [trans. title], L. SITOWSKI (*Rocz. Nauk Rolnicz., 10 (1923), No. 1, pp. 83–91, pl. 1*).—The distribution of this forest pest is discussed, together with the controlling factors. The fact that the species appears but rarely in mixed forests is explained as being due to the greater abundance of insectivorous birds and the occurrence there of ichneumonid and tachinid parasites, which have numerous other hosts living on the trees. An account is given of the parasites reared, 11 in number, of which *Ernestia rudis* Fall represents from 10 to 20 per cent. A list of 25 references to the literature is included.

A preliminary report on the oriental peach moth in New Jersey, A. PETERSON and L. A. STEARNS (*New Jersey Stas. Circ. 175 (1925), pp. 11, figs. 7*).—The data here presented supplement those reported for 1923, previously noted (E. S. R., 51, p. 760). In part 1 (pp. 3–7) biological studies are reported upon by Peterson. These include a chart showing the adult emergence and egg production at New Brunswick, where the life cycle was repeated four times, there being three full generations and a partial fourth.

In part 2 (pp. 8–11) experimental orchard control work is reported upon by Stearns. Observations of the fall application of paradichlorobenzene in many orchards for control of the peach tree borer indicate that it is also effective in killing the larvae of the oriental peach moth cocooned on the trunk of the

tree at or near the surface of the ground. The tabulated records of spring emergence indicate that cultivation with an ordinary four-bottom orchard plow, about May 1, to a depth of about 6 in., followed by thorough disking to a depth of at least 4 in., will destroy 100 per cent of the overwintered larvae and pupae on the ground about the tree. The investigations indicate that to be effective spring cultivation must be at least 4 in. deep. Summer spraying and dusting experiments conducted on 57 acres of peaches in their fourth year show "that the usual fungicidal-arsenical treatment, applied either in spray or dust form, as compared with no treatment, gave no control of the moth whatsoever, whereas the addition of 40 per cent nicotine at the 1–800 dilution (0.5 lb. to 50 gal. of water) to the usual treatment in six applications gave an increase in clean fruit amounting to 13.3 per cent. In this particular instance, the percentage of clean fruit amounted to 78.4 per cent according to the 'count tree' records, which include the amount of nonvisible injury, or 92.1 per cent as shown by the packing house records."

Tentative recommendations (part 3, p. 11) presented include the fall application of paradichlorobenzene, spring cultivation, and the use of 40 per cent nicotine at the 1–800 dilution in the shuck-split application and in applications 2, 4, 7, 9, and 11 weeks thereafter. "The applications 2, 4, and 7 weeks following the shuck-split application are Nos. 4, 5, and 6 of the existing schedule [see p. 37]. The 9- and 11-weeks applications are, on the other hand, in addition to this schedule, except as they may be combined with possible fungicidal treatments, often necessary for the control of brown rot on late varieties."

The pecan nut case-bearer, J. B. Gill (*U. S. Dept. Agr. Bul. 1303* (*1925*), *pp. 12, pls. 4*).—This is a report of investigations conducted at Monticello, Fla., of the life history and habits of *Acrobasis hebescella* Hulst, a case-bearer which is now recognized as a most formidable enemy of the pecan because of its nut-feeding habits. The data presented supplement a somewhat extended account by the author in Farmers' Bulletin 843, previously noted (E. S. R., 38, p. 157). The details of the investigation are presented in tabular form.

The nut case-bearer, together with *A. caryivorella* Rag., another nut-feeding species, is rather generally distributed in the pecan-growing sections of the Southwest, especially in Texas, where it is reported annually as causing much damage. In the Southeast, however, it has been recorded only from scattered localities in Florida, Georgia, Alabama, Mississippi, and Louisiana. For the last decade it has been causing considerable loss to growers at Monticello, Fla., and Thomasville, Ga. Under normal conditions there are three generations at Monticello, the winter being passed in the larval stage of the third generation.

A number of parasites were reared from the larvae and pupae, including *Exorista* (*Nemorilla*) *pyste* Wlk., *Habrobracon variabilis* Cush., *Calliephialtes grapholithae* Cress., *Cremastus* (*Zaleptopygus*) sp., and *Angitia* sp. The tachinid *E. pyste* is the most effective, and *H. variabilis* appears to be second in importance.

Spraying with arsenate of lead at the rate of 1 lb. powdered or 2 lbs. paste form to 50 gal. of water and milk of lime from 3 lbs. of slaked lime is the best means of control. Three applications should be made, the first soon after the nuts have set, when they are about the size of garden peas, the second a week or 10 days later, and the third from four to five weeks after the second application.

A list of 12 references to the literature is included.

The immunization of the caterpillar of Galleria mellonella by nonspecific substances [trans. title], N. Ishimori and S. Metalnikov (*Compt. Rend. Acad.*

Sci. [Paris], 178 (1924), No. 25, pp. 2136–2138).—This is a brief report of immunity work with caterpillars of the bee moth.

The external morphology and postembryology of noctuid larvae, L. B. Ripley (*Ill. Biol. Monog., 8 (1923), No. 4, pp. 102, pls. 8, fig 1*).—This is a report of studies conducted with a view to investigating the value of certain more or less neglected lines of evidence as a source of phylogenetic information.

The treatment of small batches of cotton seed against pink bollworm, O. B. Lean (*Bul. Ent. Research, 15 (1924), No. 1, pp. 37–40*).—The author's experiments show conclusively that, with the initial temperature at 60° C. (140° F.), one hour's treatment is sufficient to kill all pink bollworm in cotton seed. For the treatment of small batches of cotton seed in an anhydric electric oven, it is recommended that the seed be heated for 90 minutes with the oven working at 60°. This will insure the death of all insect life and will not damage the germinating power of the seed. A list is given of 12 references to the literature.

Papers on Indian Tabanidae, I–III, P. V. Isaac (*India Dept. Agr. Mem., Ent. Ser., 8 (1924), No. 5, pp. 53–62, pls. 4*).—The three papers here presented deal, respectively, with A Practical and Simple Method for Rearing Tabanid Larvae (pp. 53–57), The Number of Moults in Tabanid Larvae (pp. 57–59), and The Life History of *Tabanus crassus* Wlk., and the Identity of the Female of the Species (pp. 59–62).

A new aphidiphagous fly from Coimbatore, J. R. Malloch (*India Dept. Agr. Mem., Ent. Ser., 8 (1924), No. 7, pp. 67, 68*).—Under the name *Leucopis (Neoleucopis) luteicornis*, the author describes a new species parasitic on the rain-tree mealybug (*Phenacoccus iceryoides* Grn.).

Studies of the biology of dipterous parasites [trans. title], W. R. Thompson (*Bul. Biol. France et Belg., 57 (1923), No. 2, pp. 174–237*).—The author reports upon studies conducted, under the headings (1) natural selection in the dipterous parasites of insects (pp. 175–200), and (2) specific adaptation in the entomophagus parasites (pp. 201–237).

The biology of Tachina larvarum Meigen [trans. title], R. Matthey (*Ann. Parasitol. Humaine et Compar., 2 (1924), No. 3, pp. 202–206, figs. 4*).—A report of studies of a tachinid which often parasitizes the large sphingid caterpillars *Chaerocampa elpenor* and *Pterogon proserpina* in France.

A study of the leaf-mining Diptera of North America, S. W. Frost (*New York Cornell Sta. Mem. 78 (1924). pp. 5–228, pls. 14, figs. 2*).—The author first discusses the manner of conducting the investigation, collecting methods adapted for leaf miners, handling the material at the laboratory, and the preservation of the material for study. This is followed by a review of the more important papers dealing with the dipterous leaf miners; the leaf-mining habit and mines of Diptera; the host plants of dipterous leaf miners; the relation between the leaf mines and the gall makers; the abundance, distribution, and habits of the leaf-mining diptera; the families and genera of dipterous leaf miners; and a key to the larvae of the leaf-mining families of Diptera. The species of leaf-mining Diptera are then considered, the arrangement being by families (pp. 29–129). A revision of the North American species of Phytomyza (pp. 58–90) is included. The parasitic and predacious enemies of dipterous leaf miners are then briefly considered. A list of Hymenoptera parasitic on dipterous leaf miners (pp. 131, 132), a list of the leaf-mining Diptera of the world and their host plants (pp. 133–178), the host plants of

leaf-mining Diptera of the world (pp. 174–190), a bibliography (pp. 191–210), and an index to the species (pp. 225–228) follow.

Bionomics of Hippodamia tridecem-punctata L., C. R. Cutright (*Ann. Ent. Soc. Amer., 17 (1924), No. 2, pp. 188–192*).—A report of studies of this ladybird beetle at the Ohio Experiment Station.

The tuart bud weevil (Haplonyx tibialis), L. J. Newman and J. Clark (*Jour. Dept. Agr. West. Aust., 2. ser., 1 (1924), No. 3, pp. 357–360, figs. 4*).—This is a brief account of a weevil that attacks the flower buds of the tuart (*Eucalyptus gomphocephala*), one of the most useful Australian hardwoods.

A progress report of boll weevil poisoning work at the Holly Springs Branch Experiment Station, C. T. Ames (*Mississippi Sta. Circ. 54 (1924), pp. 12*).—This is a revision of Circular 51, previously noted (E. S. R., 50, p. 760), with a brief reference appended to experiments conducted in 1924. The effect of early poisoning tests during that year indicated that one early application is a cheap insurance against heavy infestation later if the weather should be favorable for weevils. The hot weather almost completely controlled the weevil infestation whether poisoned or not poisoned, and very little difference could be found in the final results.

The eucalyptus snout-beetle (Gonipterus scutellatus Gyll.), C. W. Mally (*Union So. Africa Dept. Agr. Jour., 9 (1924), No. 5, pp. 415–442, figs. 17*).—This is a report of studies of a new pest, probably of Australian or Tasmanian origin, which first came to notice in South Africa late in 1916. Many species of Eucalyptus are said to escape attack, and many others are attacked only slightly. The four species that suffer most are, in the order of apparent preference, *E. viminalis*, *E. punctata*, *E. globulus*, and *E. urnigera*. The defoliation of plantations of the most preferred species has caused the death of some trees and very materially diminished the value of most others, checking their growth and gravely deteriorating the quality of the wood. The country within a radius of 100 miles of Cape Town appears to be generally infested.

No parasites of the insect have thus far been observed, and no wild birds have been seen to molest it. Contact insecticides are considered of little value in combating it, but both larva and adult readily succumb to arsenate of lead, and this is recommended for use on hedges and in young plantations.

The life of bees and wasps, C. Ferton (*La Vie des Abeilles et des Guêpes. Paris: E. Chiron, 1923, pp. XV+376, figs. 72*).—The several chapters of this work deal with the instinct of pompilids (pp. 1–65), other sphegids (pp. 67–153), the effects of the venom (pp. 155–173), the wasps (pp. 175–206), the chrysids (pp. 207–226), the gastrilegid Mellifera (pp. 227–268), the other Mellifera (pp. 269–284), orientation and the return to the nest (pp. 285–308), the degrees of variability of instinct in the Hymenoptera (pp. 309–330), and the Hymenoptera of Corsica (aphids, sphegids, pompilids, and vespids) (pp. 331–343). In an appendix (pp. 345–373) an account is given of the life and work of J. H. Fabre, entomologist (1823–1915), which first appeared in 1916.[2] A list of the entomological works of Ferton, 22 in number, is included.

The subject matter was selected, grouped, and annotated by E. Rabaud and F. Picard from notes left by Ferton.

Practical beekeeping, A. M. Stubbes (*London and New York: Cassell & Co., Ltd., 1924, pp. XIX+308, pls. 17, figs. 23*).—The several parts of this practical account deal with the beekeeping industry (pp. 1–35), bee life in nature (pp. 37–67), the races of bees (pp. 69–102), the rational system of beekeeping (pp. 103–157), swarm control and honey production (pp. 159–197), the rearing of queens (pp. 199–231), and the diseases of bees (pp. 233–296).

---

[2] Rev. Sci. [Paris], 54 (1916), II, No. 18, pp. 545–551.

Honey plants [trans. title], R. T. BARRETO (*Agricultura [Santiago de las Vegas], 2 (1924), No. 2, pp. 4–7, figs. 3*).—This is a list of the principal honey plants in Cuba.

I, Foulbrood control and diseases of bees. II, Foulbrood law and revised regulations, F. L. THOMAS and C. S. RUDE (*Texas Sta. Circ. 36 (1924), pp. 3–24, figs. 10*).—A report of the inspection work carried on under the Texas foulbrood law during the period 1910 to 1923 is first presented. During the year 1922–23, 43,000 colonies were examined by the foulbrood inspectors, and less than 1 per cent were found infected with American foulbrood. It was found to occur in colonies in 24 counties. An account of bee diseases, next presented, is followed by the text of the Texas foulbrood law and revised regulations.

Two mutillids (Hym.) hyperparasitic on white grubs (Scarab., Col.), W. P. HAYES (*Bul. Brooklyn Ent. Soc., 19 (1924), No. 4, p. 153*).—The author records the rearing, at the Kansas Experiment Station, from cocoons of *Elis quinquecincta*, a parasite of white grubs, of two species of Mutillidae, namely, *Mutilla quadriguttata* Say and *Dasymutilla permista* Mkl.

Ants as pests, J. CLARK (*Jour. Dept. Agr. West. Aust., 2. ser., 1 (1924), No. 3, pp. 317–319, fig. 1*).—The author calls attention to the possible danger of the introduction of the Argentine ant, which has not as yet been found to occur in Australia. The Australian species are said to be of minor importance, with the possible exception of one commonly known as the meat, or mound, ant (*Iridomyrmex detectus*), which appears to be well on the way to becoming a pest of some importance. It attacks citrus trees in New South Wales, cutting off the small leaves and twigs and stripping the soft bark from the young growth, carrying the fragments to its nest.

Observations on the biology of ichneumonids [trans. title], A. SEYRIG (*Ann. Soc. Ent. France, 92 (1923), No. 4, pp. 345–362*).—These observations relate to ichneumonid parasites of wood-mining insects, hibernation of ichneumonid females, and the discovery of an ichneumonid gynandromorph.

Trichogramma evanescens Westw., a parasite of the eggs of Pieris brassicae L. [trans. title], C. FERRIÈRE and J. C. FAURE (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 2, pp. 104–118*).—The authors report upon studies of *T. evanescens*, which highly parasitized the eggs of *P. brassicae* in the region of Lyon, France, in 1923. From 12 to 15 days are required in August for the completion of its life cycle. The parasite deposits its eggs at any time during the development of the host's eggs, even when the young larva is well formed.

The authors find that Trichogramma have been recorded from Europe under 11 different names. Morphologically they appear to represent a single species, although it is quite probable that there are several distinct biological species. The host list of Trichogramma in Europe is large, representing five different orders. A list is given of 35 references to the literature.

Notes on the life history of Ascaridia perspicillum (Rud.), J. E. GUBERLET (*Amer. Micros. Soc. Trans., 43 (1924), No. 3, pp. 152–156*).—The remarkable developments discovered in the study of the life history of *Ascaris lumbricoides* L. by Ransom and others (E. S. R., 48, p. 84) led the author to conduct a series of experiments and observations, largely at the Oklahoma Experiment Station, on the life history of the common chicken nematode, *Ascaridia perspicillum* (Rud.), which were continued at intervals from August, 1918, to June, 1923, inclusive.

It was found that the larvae of this nematode do not follow the course of migration through the body of the host pursued by *A. lumbricoides*. Their normal habitat is the intestine, where they may become partially imbedded in the mucosa. The larvae may occasionally migrate slightly from their normal

habitat in the intestine and reach other tissues or organs, but this appears to be an abnormal condition. Attempts to infest birds by removing larval worms from the intestine of one bird to the alimentary canal of another resulted negatively. Very heavily infested young chicks invariably died from intestinal irritation and toxemia on the tenth to twelfth days after feeding embryonated eggs.

The results of the investigations on the whole are said to agree very closely with those obtained by Ackert in 1923, previously noted (E. S. R., 51, p. 385). A list of 11 references to the literature cited is included.

Rocky Mountain spotted fever: Experimental studies on tick virus, R. R. SPENCER and R. R. PARKER (*Pub. Health Rpts.* [*U. S.*], *39* (*1924*), *No. 48, pp. 3027–3040, figs. 6*).—Investigations here reported confirm earlier observations of other workers that ticks of the species *Dermacentor venustus* (*andersoni*) which have received the infection of Rocky Mountain spotted fever in the larval or nymphal stage retain it in the adult stage.

"A 24-hour incubation at 37° C. (98.6° F.) of unfed hibernating nymphs and adults infected as larvae and subsequent injection of emulsions of such ticks into guinea pigs give a higher percentage of positive infection than the injection of similar ticks not incubated. Infection of Rocky Mountain spotted fever in adult ticks subjected to winter temperatures (32° F. or below) may be demonstrated by the production of immunity in guinea pigs following the injection of tick viscera immediately upon removal from cold temperatures, by a moderate but typical spotted fever following the injection of ticks after 24 hours' incubation at 37° C., and by virulent spotted fever following tick feeding or the injection of ticks after feeding. Control adult ticks free from all infection do not produce death or illness in guinea pigs by feeding nor by injection of such ticks after feeding. One infected adult tick may contain after feeding from 3,000 to 5,000 minimum infectious doses for a guinea pig. Emulsion of infected fed adult ticks treated with 0.5 per cent phenol will protect guinea pigs against 1 cc. of blood virus. Nothing in the behavior of blood or tissue virus is comparable to the changes observed in tick virus."

Biology and control of the garden centipede, Scutigerella immaculata (Newport), F. H. WYMORE (*Jour. Ent. and Zool.*, *16* (*1924*), *No. 3, pp. 73–88, figs. 5*).—This is a report of studies, at the University of California, of *S. immaculata*, which is a serious pest of truck crops in California, Oregon, Utah, and Colorado. The injury is caused through the eating of numerous small holes into the host plant beneath the surface of the soil. In California the adults, eggs, and larvae have been found in some of the cultivated asparagus fields in the delta section of the Sacramento River. The adults can be found in infested fields about the asparagus crowns at any time of the year. The eggs were found at various times from April 17 throughout the summer until August 7. Paradichlorobenzene proved very effective in a single instance as a control for the pest. Thus far flooding has proved the most efficient and satisfactory control measure. A list is given of 22 references to the literature cited.

FOODS—HUMAN NUTRITION

Missouri flour for Missouri breadmaking, L. E. DAVIS (*Missouri Sta. Bul. 227* (*1924*), *pp. 3–30, figs. 28*).—In the introduction to this publication, which is a contribution from the department of home economics, it is stated that only 15 per cent of the flour produced in Missouri is consumed within the State. This is attributed to the demand for hard flour instead of soft flour for bread making. To determine whether good bread can be made from Missouri soft

flour, a series of experiments was conducted altering the proportions of ingredients, methods of mixing, time of fermentation, conditions of baking, etc., until a combination was found which resulted in a bread equal in quality to that produced from hard wheat.

The proportions of ingredients required for a 1-lb. loaf are given as 3½ cups flour, from ⅝ to ¾ cup water, one cake compressed yeast, 4 teaspoons sugar, 1 teaspoon lard, and 1 teaspoon salt. Using this recipe, the best results were obtained with the straight dough process, allowing the dough to double its bulk in the first rising, to treble its bulk in the second rising period or in the pan, and to finish proving in the oven with a baking temperature of from 350 to 420° F. for about 35 minutes. The total time required to make a loaf of bread from Missouri flour is said to be from 2 to 4 hours less than is required for hard wheat flour.

The ripe olive survey of 1924, C. THOM, H. C. COLSON, and L. H. JAMES (*Amer. Jour. Pub. Health, 14 (1924), No. 12, pp. 1029–1034*).—As a result of three outbreaks of botulism due to canned ripe olives occurring during 1924, the Bureau of Chemistry, U. S. D. A., conducted a survey similar in scope to one previously reported (E. S. R., 43, p. 168), with the following results:

From the stocks of canned ripe olives, 800 official samples totaling over 2,900 containers of ripe olives from 30 States, the District of Columbia, and Porto Rico were collected and examined. Only spoiled or suspected samples were included. No olives capable of causing botulism were found, although there were many swelled cans, some of which had odors suggestive of olives infected with *Bacillus botulinus*. Questionable or markedly spoiled olives were found in containers of every brand examined. The principal defect in most of the samples was the corrosion of the containers, which varied from etching of the interior of the can to almost complete disappearance of tin in places. It was found that many of these samples had remained upon the dealers' shelves for several years.

In commenting upon this the authors state "as a part of the information needed to prevent accumulation of old and progressively deteriorating material upon the dealers' shalves, every can should be plainly marked with the year of the pack, with some limit of guarantee, or should in some other manner furnish adequate information upon which the dealer and consumer may avoid the handling of such unfit products."

Problems of food, with special reference to India, R. MCCARRISON (*Jour. Roy. Soc. Arts, 73 (1925), No. 3763, pp. 137–153, fig. 1*).—This general discussion of nutritional problems is based upon the author's observations and investigations in India, which have been noted previously from various sources. Of particular interest is the discussion of the remarkable difference in the physical efficiency of the various races of India, differences which can be traced chiefly to the dietary habits of these races. The races showing the highest degree of physical efficiency are those whose diets are largely lacto-vegetarian. In commenting upon these observations, the author suggests that "if a closer study of the food habits of different races of mankind were made, we should find as much material on which to base sound judgments as to the origin of many common diseases as we now find within the four walls of the best equipped laboratory."

The oxidation of cystine and cysteine in the animal organism, A. R. ROSE, G. J. SHIPLE, and C. P. SHERWIN (*Amer. Jour. Physiol., 69 (1924), No. 3, pp. 518–530*).—In an attempt to determine which groups in cysteine and cystine are attacked on oxidation in the body, rabbits were fed or given subcutaneous injections of a number of cysteine and cystine derivatives in which 1, 2, or all of the 3 sensitive groups (—NH_2, —SH, and —COOH) were protected by some

aromatic radical, and the amount of the substances oxidized was determined by analyses of the urine.

Oxidation was not prevented by the blocking of any of the groups alone, but was completely prevented by the simultaneous blocking of the amino group and the sulfur group, showing these to be the vulnerable points. The data are also thought to furnish evidence that cysteine and cystine are mutually convertible in the animal body.

Studies on the metabolism of obesity, I–III (*Arch. Int. Med., 34 (1924), Nos. 3, pp. 267–281, fig. 1; 4, pp. 573–583, figs. 3*).—The three papers noted below form a part of a series of metabolic studies undertaken to determine the cause of obesity.

I. *The relation between food intake and body weight in some obese persons*, S. Strouse and M. Dye (pp. 267–274).—This paper consists of a review of the literature on the relation of food intake to obesity, together with brief reports of dietary studies of four cases of obesity and one of underweight.

The data from both sources show the existence in some persons of a predisposition to obesity which can not be correlated with excessive food intake and lack of exercise. In the cases reported, the food intake was in general below the basal metabolic requirements. In the case of an apparently healthy woman weighing 151.5 lbs., the weight was reduced only 3 lbs. in 8 days by a diet averaging only 621 calories daily. In the underweight subject, a man whose height was 175 cm. and weight 52 kg., there was no gain in weight during a 4 weeks' vacation when the food intake was increased approximately 50 per cent and but little exercise was taken.

"The data thus accumulated definitely prove that certain types of obese persons maintain their weight without regard to the usually accepted caloric balance."

II. *Basal metabolism*, S. Strouse, C. C. Wang, and M. Dye (pp. 275–281).—In this paper data from the literature and from the authors' studies are reported on the basal metabolism of obese subjects. The original data include, in addition to 33 observations on 17 overweight subjects, 11 on 6 normal and 17 on 9 underweight subjects. Some of the observations were made with the Benedict portable respiration apparatus and some with the Tissot gasometer. The mathematical calculations were made on the basis of the Harris-Benedict prediction tables and also from the height-weight formula for body surface of Du Bois. Results obtained by the two methods showed fairly close correlation.

Curves plotted to show the deviation from normal for each person for weight and for metabolism showed no constant relation between the weight variations of any subject and his basal metabolism. The basal metabolic rates were above and below the zero line, but in most cases within 10 per cent of it. It is concluded that obesity can not be caused by changes in basal metabolism.

III. *The specific dynamic action of food*, C. C. Wang and S. Strouse (pp. 573–583).—The authors, with the technical assistance of A. D. Saunders, have conducted metabolism determinations on 12 obese, 5 thin, and 5 normal subjects before and at suitable intervals after test meals of protein, fat, and carbohydrate, respectively. The subjects were among those whose basal metabolism was reported in the previous paper.

The protein meal, which consisted of scraped beef, one or two glasses of milk, two slices of bread, and a small piece of butter, the whole furnishing from 32 to 66 gm. of protein, had only a slight specific dynamic action on the obese subjects, but produced a marked increase in metabolism in the thin and a considerable increase in the normal subjects. The carbohydrate meal consisted of about 100 gm. of sucrose in the form of lemonade or fondant. The increase in metabolism at the end of the first half hour was most marked

for the normal subjects. For the thin subjects there were two peaks, one at the end of the first half hour and one at the end of the second hour. In the obese subjects, the increased metabolism at the end of the first half hour was about the same as that of the thin subjects, but there was no second peak. Following the fat meal, which consisted of slightly sweetened ice cream made from 40 per cent cream, the amount of fat varying from 55 to 129 gm., there was a slight increase in the heat production in all cases. The average maximum increase for the obese subjects was 5.8 per cent above the basal, for the thin subjects 10.5 per cent, and for normal subjects 6.8 per cent. In the obese subjects the peak occurred at the end of the fourth hour, while in both thin and normal subjects there were two peaks, at the end of the second and sixth hour, respectively.

An experimental study of ununited fractures with special reference to the inorganic bone-forming elements in the blood serum, H. A. PETERSEN (*Bul. Johns Hopkins Hosp., 35 (1924), No. 405, pp. 378–381, pls. 2*).—In this investigation the content of calcium and phosphorus in the serum of 20 normal dogs was first determined. The minimum, maximum, and average results in milligrams per 100 cc. of serum were calcium 9, 10.7, and 10.1 and phosphorus 4, 8.8, and 6. Corresponding values for the product of calcium and phosphorus, a factor considered to be of value in its relation to the healing fracture, were 36, 93.2, and 60.6, respectively.

Some of the animals were then placed on diets deficient in calcium and phosphorus, as well as in vitamin A and antirachitic vitamin, and weekly analyses were made of the blood serum. When a definite lowering of the phosphorus content of the serum had taken place, the bones of the forelegs of the animals were fractured and the animals were placed on a diet low in phosphorus and high in calcium. For purposes of comparison, the bones of other dogs on the stock diet furnishing sufficient phosphorus but almost no calcium were fractured and the course of healing of the fractures noted.

The results obtained confirm clinical results previously obtained with human subjects, that a definite relationship exists between the concentration of calcium and phosphorus in the blood serum and the rate of repair of bone tissue. In the dogs in which the phosphorus content of the serum was reduced to such a point that the product of the calcium and phosphorus was less than 30 the fractures did not unite, but when the phosphorus and the calcium-phosphorus product were again raised to normal level, union of the fractures resulted.

The significance of vitamins in the exchange of the animal body.—III, The influence of protein, carbohydrate, and fat hunger on avitaminosis [trans. title], L. A. TSCHERKES (*Biochem. Ztschr., 149 (1924), No. 1–2, pp. 51–62*).—The conclusion drawn in the previous paper of the series (E. S. R., 50, p. 565) that the progress of polyneuritis in pigeons is influenced by the content of proteins, fats, and carbohydrates and by the energy value of the food is thought to be substantiated by the results obtained in two further series of experiments, each comprising three groups of pigeons on vitamin-free diets. In the first series no protein was fed in the first group, no carbohydrate in the second, and no fat in the third. In each of these groups some of the pigeons received an excess of calories, others a deficiency, and still others a suitable quantity. In all three groups the typical symptoms of polyneuritis were less severe in pigeons on diets furnishing an insufficiency of calories. In the second series, the diets of the three main groups consisted of protein, fat, and carbohydrate exclusively. Again the symptoms of polyneuritis were less marked on the diets furnishing insufficient calories.

The relation of natural foodstuffs and their treatment on growth and reproduction, H. G. Miller and W. W. Yates (*Jour. Biol. Chem.*, *62* (*1924*), *No. 1, pp. 259–268, figs. 15*).—In connection with previously reported work on potassium in nutrition (E. S. R. 49, p. 568), evidence was obtained confirming the conclusion of Evans and Bishop that wheat embryo contains a dietary factor other than vitamin B, which is essential for reproduction (E. S. R. 51, p. 167). Corn was found to contain this factor and to lose it on extraction with cold water and drying at a temperature not exceeding 100° C. The factor was present in wheat embryo, the alcoholic extract of wheat embryo, and green kale, but was absent from yeast.

Dietary requirements for reproduction.—III, The existence of the reproductive dietary complex (vitamin E) in the ethereal extracts of yellow corn, wheat embryo, and hemp-seed, B. Sure (*Jour. Biol. Chem.*, *62* (*1924*), *No. 2, pp. 371–396, figs. 13*).—In continuation of the investigation previously noted (E. S. R., 51, p. 563), evidence is presented that the ether extracts of yellow corn, wheat embryo, and hemp seed contain the dietary factor essential to reproduction, designated by the author as vitamin E and by Evans and Bishop as vitamin X. From 3 to 5 per cent of the oil was found to be sufficient to prevent reproductive failure. Fertility was also secured with 5 per cent of commercial cottonseed and olive oils, but not with commercial coconut, linseed, or sesame oils.

In connection with these experiments, it was also demonstrated that the amount of vitamin B required for the normal function of the mammary gland is greater than that for growth. A change from 0.4 to 0.5 per cent of Harris yeast powder as a source of vitamin B was in some cases sufficient to secure normal lactation and rearing of the young on diets which had been found adequate for reproduction but not lactation. In much of the work the entire protein of the ration was furnished by skim milk powder to the extent of from 35 to 50 per cent of the ration. It is concluded that skim milk powder, when fed to this extent, furnishes amino acids sufficient in quantity and of excellent quality for reproduction. The only mineral supplement found necessary was 0.2 per cent of ferric citrate.

Biological food tests.—VIII, Vitamins A and B in radish, A. F. Morgan (*Amer. Jour. Physiol.*, *69* (*1924*), *No. 3, pp. 634–637, fig. 1*).—The author's vitamin studies (E. S. R., 52, p. 762) have been extended to determinations of the content of vitamins A and B in young radishes dried at 60° C.

In the vitamin A experiments, 1 gm. daily of the dried radish, corresponding to approximately 8 gm. of fresh radish and constituting about 25 per cent of the total food eaten, proved inadequate to prevent decline and death on a vitamin A-deficient diet. In the vitamin B experiments, 1 gm. daily proved sufficient to bring about nearly normal growth. The vitamin B content of radishes is from these results considered to be about the same as of fresh milk or orange juice.

Do edible mushrooms possess antiscorbutic properties? [trans. title] H. Steidle (*Biochem. Ztschr.*, *151* (*1924*), *No. 3–4, pp. 181–186, figs. 2*).—Two varieties of mushrooms, *Cantharellus cibarius* (chanterelle) and *Psalliota campestris*, were found to possess no antiscorbutic properties.

Inactivating action of some fats on vitamin A in other fats, L. S. Fridericia (*Jour. Biol. Chem.*, *62* (*1924*), *No. 2, pp. 471–485, figs. 8*).—In this investigation conducted at the University of Copenhagen, evidence was obtained from feeding experiments with young rats that certain fats when intimately mixed with butterfat destroy the vitamin A of the butter. Of the fats tested, a sample of hydrogenated whale oil and lard which had been heated in thin layers in the air possessed this property, while hydrogenated coconut

oil, hydrogenated hemp seed oil, and nonhydrogenated coconut oil did not inactivate vitamin A. That the failure of the animals to grow when fed the mixture of hydrogenated whale oil or lard with butter was not due to a toxic action was shown by the normal growth resulting when the same fats were fed separately.

Attention is called to the possible bearing of these results on the interpretation of previous vitamin A experiments and on certain problems of cooking, such as frying foods containing vitamin A.

Ophthalmia as a symptom of dietary deficiency, T. B. OSBORNE and L. B. MENDEL (*Amer. Jour. Physiol., 69 (1924), No. 3, pp. 543–547*).—To supplement an earlier report on the incidence of ophthalmia in rats on diets deficient in vitamin A (E. S. R., 45, p. 569), the authors, with the collaboration of H. C. Cannon, have examined the records of about 4,000 of their rats (numbers 6,000 to 10,376). Of this number 493 received diets containing little or no vitamin A and were under observation 20 days or more. Ophthalmia was recognized in 297 of these animals, or 60 per cent.

Further subdividing the 493 rats according to the nature of the diet, in the group of 114 on the most highly purified diets 94 showed positive eye symptoms. In this group, in 88 animals receiving edestin as the protein the incidence of ophthalmia was 83 per cent, in 23 receiving casein purified by extraction with fat solvents 80 per cent, and in 3 on extracted meat residue 100 per cent. That the eye disease was not the result of unsatisfactory proportions of the salt constituents, suggested by McCollum, Simmonds, and Becker as occasionally being responsible for this trouble (E. S. R., 48, p. 464), was shown by the high incidence of ophthalmia, 84 per cent, among 64 rats receiving a salt mixture known to be adequate.

Iodine in nutrition; goiter as a nutritional problem, H. C. SHERMAN (*Amer. Jour. Pub. Health, 14 (1924), No. 12, pp. 1038–1042*).—That iodine is now recognized as an essential element in nutrition is emphasized by its being made the subject of the annual report of the committee on nutritional problems of the American Public Health Association. The report deals briefly with goiter as an iodine deficiency disease, the requirement of the human body for iodine, its distribution in natural foods and drinking water, and methods adopted in different localities to make up for iodine deficiency. It is suggested in conclusion that "just as our present knowledge of vitamins shows that they are of great importance in other nutritive relations beside the prevention of deficiency diseases, so the future may not improbably reveal other nutritional benefits to be derived from a proper understanding of the distribution of iodine in foods and its function in nutrition, in addition to the prevention of simple goiter."

The nature of the sugar in normal urine.—II, The sugar excretion upon various diets and the influence of diet upon glucose tolerance with some remarks on the nature of the action of insulin, I. GREENWALD, J. GROSS, and J. SAMET (*Jour. Biol. Chem., 62 (1924), No. 2, pp. 401–434*).—In continuation of the investigation previously noted (E. S. R., 52, p. 806), a series of metabolism experiments conducted upon a human subject and two dogs to determine the source, nature, and extent of sugar in normal urine is reported, with a discussion of the significance of the results obtained and their bearing on the nature of the action of insulin.

It is concluded from the present investigation and from studies previously reported in the literature that the sugars excreted in normal urine consist of difficultly assimilable carbohydrates such as lactose from milk, pentoses from fruits, and caramelized sugars and dextrins, and of reducing substances de-

rived from the protein of the food and from endogenous sources. By far the larger part of the urinary sugar is considered to belong to the latter group, but evidence is submitted that this form of sugar does not arise from nuclein metabolism but consists more probably of pentoses formed from proteins.

Evidence was obtained in both series of experiments that the tolerance for glucose is distinctly lowered by a carbohydrate-free diet and to a much greater extent by a high fat than a high protein diet. It is considered that glucose may appear in the urine of normal persons after the ingestion of large quantities of glucose or after the ingestion of a carbohydrate meal immediately following a period on a carbohydrate-free diet, but that, upon a mixed diet or a carbohydrate diet not containing large quantities of glucose, the concentration of glucose in the blood never reaches such a point that the urine contains glucose.

The authors' theory concerning the nature of the action of insulin is essentially as follows: The main function of insulin is to combine glucose with some other substance, apparently phosphate. "The subsequent fate of this compound depends upon the conditions existing within the body, particularly the concentration of glucose in the blood, the concentration of insulin, and the energy requirements of the body. If there is a demand for energy, as there is in severe diabetes, the glucose : X is oxidized, for which process insulin again appears to be required. If the demand for energy is satisfied and the concentration of insulin is not excessive, glycogen is deposited. If the concentration of glucose in the blood is low, glucose : X or glycogen will normally be converted into glucose in order to keep the concentration of the latter within normal limits. But, in the presence of an excess of insulin, the equilibrium conditions are disturbed. The reaction is forced in another direction. Fat formation occurs or begins. It may not be complete; in the absence of other necessary factors, it may be arrested at some intermediate stage; it may not take place in the liver exclusively or at all."

Effect of insulin and muscle tissue on glucose in vitro, C. Lundsgaard and S. A. Holbøll (*Jour. Biol. Chem., 62 (1924), No. 2, pp. 453–469, figs. 4*).—In this contribution from Medical Clinic A of the University of Copenhagen, the effect of insulin on sugar metabolism was studied by a comparison of the rotatory and reducing power of solutions of glucose before and after being acted upon by insulin under varying conditions. In order to obtain clear sugar-containing liquids from mixtures of glucose with insulin, blood, or muscle tissue, the materials were dialyzed through collodion tubes dried in 80 per cent alcohol.

No change in the reducing or rotatory power of solutions of glucose resulted from the action of insulin alone or in the presence of blood. Similarly, no change took place in mixtures of glucose and muscle without insulin, but in mixtures of glucose, muscle tissue, and insulin a decrease in the optical rotatory power of the dialysate took place, with no change in reducing power. The extent of this change was found to be affected by a number of factors. The great difference between reducing and rotatory power was found at the end of two hours. This was shown to be due, not to lack of insulin, but to a loss of activity of the muscle tissue after this length of time. Within the conditions of the experiment, the original concentrations of glucose and of insulin were without effect, but the amount of glucose acted upon increased with the amount of muscle tissue. In no case did the specific rotatory power of the solution decrease below 22.5°, indicating the reversibility of the process. The reverse process was found to be slow and not to be affected by the presence of normal gastric juice.

It is concluded that the results obtained may "be explained either by assuming a formation of γ-glucose or simply by a change in the equilibrium between α-and β-glucose in such a way that the concentration of β-glucose is increased at the cost of the α-form. According to either view the decrease in the rotatory power must go parallel with the amount of glucose transformed. The observed difference between the observed reduction power and rotatory power must, therefore, be a quantitative expression of the amount of glucose transformed by the combined action of insulin+muscle tissue under the conditions given."

Diabetic diets in grams per kilogram of body weight, H. GRAY (*Jour. Amer. Med. Assoc., 84 (1925), No. 1, p. 14*).—Data reported from a number of diabetic clinics on the diets used in connection with the insulin treatment of diabetes in children have been calculated to grams per kilogram of body weight and presented in tabular form, grouped by clinics, and averaged as a whole. The general averages for the 140 cases are as follows: Carbohydrate 2.6, protein 2.1, and fat 4.1 gm. and energy 55 calories per kilogram of body weight, with an average insulin requirement of 20 units a day.

ANIMAL PRODUCTION

A study of the principal changes which take place in the making of silage, W. H. PETERSON, E. G. HASTINGS, and E. B. FRED (*Wisconsin Sta. Research Bul. 61 (1925), pp. 32, figs. 5*).—The results of a study of the bacteriological, chemical, and physical changes involved in silage production are reported.

For this investigation a stave silo 10 ft. in diameter and 30 ft. high was filled with Golden Glow corn cut in the early dent stage on September 16, 1922. Waterproof bags containing weighed samples of the fresh silage were placed at 10- and 20-ft. distances from the bottom. All samples of the silage removed for determinations were taken from the zone between the bags by boring through the wall of the silo. Temperatures were taken by suspending a thermometer in an inch pipe running the full depth of the silo. The following data were recorded at different intervals on the samples of the silage collected. Moisture, volatile and nonvolatile acids, alcohol, reducing sugars, pentosans, starch, total nitrogen, ammonia, amino nitrogen, and soluble nitrogen, as well as the numbers and groups of microorganisms represented in the silage juice. The silo gases were also analyzed for carbon dioxide, oxygen, hydrogen, and hydrocarbons.

The results showed that the first change to occur in silage production involves a rapid disappearance of the oxygen within from 4 to 5 hours, which is accompanied by a rapid increase in carbon dioxide to from 60 to 70 per cent in 48 hours. The change in the gases is followed by an increase in temperature of the silage up to 15 days, which continues at a high level, though with some reduction, for from 60 to 70 days. The numbers of bacteria increase rapidly during the first few hours after ensiling. This is associated with an increased production of fermentation products. As these products increase in amounts, the bacterial flora are changed. The yeast cells are reduced, and the high acid-forming bacteria become very numerous. The slower-growing organisms disappear. As the acidity of the silage is materially increased, the total bacteria are decreased in numbers. The chemical analyses of the fresh and fermented silage showed that approximately 10 per cent of the dry matter, 25 per cent of the pentosans, and 25 per cent of the starch were destroyed during four months' ensiling.

Changes occurring in sterilized corn inoculated with *Lactobacillus pentoaceticus* were similar to those occurring in normal silage. The fermentation of artificially inoculated silage was more vigorous, but any advantage from it would hardly warrant the added trouble in practical silage production.

Production and feeding of silage, L. J. STADLER, M. M. JONES, C. W. TURNER, and P. M. BERNARD (*Missouri Sta. Bul. 226 (1924), pp. 23, figs. 8*).—A brief discussion of the varieties of the various crops best adapted to use for silage, with directions for planting, growing, harvesting the crop, and filling the silo. A portion of the work deals with the feeding of silage.

Legumes for livestock, C. W. MCCAMPBELL (*Kans. Agr. Col. Ext. X-Form No. 221 (1924), pp. 4*).—A popular discussion of the value of legumes as protein supplements and for pasture, based on the results of feeding experiments at the stations.

Rations for hogs, dairy cows, beef cattle, horses, and sheep (*Oklahoma Sta. Circ. 57 [1925], p. 8*).—Suggested rations are given for feeding and fattening hogs, sheep, beef cattle and dairy cows, and work horses.

The price of feed utilities, G. S. FRAPS (*Texas Sta. Bul. 323 (1924), pp. 3-24, figs. 5*).—The author presents a method for calculating the comparative values of different feeding stuffs based on the productive energy and the digestible protein in the feed. The prices to be allowed for the productive energy and digestible protein are calculated from the collective prices of carbohydrate and protein feeds. It is shown that the market prices of concentrates are fairly close to the calculated value, but with roughages there is an additional value for the bulk.

On the production of body size in animals and the relation of size to energy requirements [trans. title], M. RUBNER (*Sitzber. Preuss. Akad. Wiss., No. 14-17, pp. 217-234, fig. 1*).—A discussion of the rates and limitations of growth and the control of temperature in warm and cold blooded animals with reference to their influence on the energy required for growth.

Studies in nutrition, I–IV, P. MENAUL (*Oklahoma Sta. Bul. 152 [1925], pp. 3-13, figs. 5*).—Brief results of studies of the nutritional value of sorghums and of raw and pasteurized milk are noted.

I. *The nutritional value of the grain sorghums* (pp. 3-5).—In determining the value of sorghum grains as sources of vitamins three lots of 4 young rats each were selected and fed for 1 month on one of the following grains as the sole ration: Yellow kafir, darso, and white kafir. A fourth group was fed as a control. After 1 month feeding on these limited rations growth became stationary and vitamin-free milk powder and a salt mixture were added to the ration for 60 days, during which time all four lots made approximately equal gains. Growth was again practically reduced to nil when the milk powder was removed from the ration. The author concludes that all three sorghums contain sufficient vitamins for normal growth, the addition of the milk powder supplying deficient proteins.

II. *The nutritive value of milk from stover-fed and silage-fed cows* (pp. 6-8).—Eight young rats and 8 young guinea pigs were used for comparing the growth-promoting properties of the milk from a cow receiving a grain ration of oats, wheat middlings, corn chop, cottonseed meal, and kafir stover with the milk produced by another cow receiving kafir silage in place of the kafir stover. The rats and guinea pigs received daily amounts of milk equal to 10 per cent of their live weight in addition to a salt mixture and a ration of alfalfa flour and oatmeal which were previously autoclaved and dried. None of the rats or guinea pigs showed evidence of nutritional disease during 60

days of feeding, but the guinea pigs receiving milk from the silage-fed cow made considerably better growth.

III. *The effect of ensiling on the vitamine content of the grain sorghums* (pp. 9, 10).—A ration of vitamin-free milk powder, ensiled white kafir seed, and a salt mixture was found to contain sufficient nutrients to produce normal growth in one-week-old rats when fed to their mothers and continued as the ration of the young two months after weaning. The author concludes that ensiling does not impair the nutritional value of the grain.

IV. *The nutritive value of milk as affected by heat* (pp. 11, 12).—Three lots of 6 young guinea pigs each were used for comparing the feeding value of raw and pasteurized milk. All lots received a ration of rolled oats, alfalfa flour, and a salt mixture which was found to cause scurvy and eye disease in from 10 to 13 days. In addition to this basal ration the three lots received daily amounts equal to 10 per cent of their live weight of raw milk and milk pasteurized for 20 minutes at 145° F. in closed and open bottles. Average normal growth was attained by all animals, but the author concludes that "for purposes of nutriment raw milk is superior to closed pasteurized milk and that the closed pasteurized is superior to the open pasteurized."

The history of the races of domestic animals and their influence on the history of humanity, F. P. Stegmann (*Die Rassengeschichte der Wirtschaftstiere und ihre Bedeutung für die Geschichte der Menschheit. Jena: Gustav Fischer, 1924, pp. VIII+371, figs. 108*).—This describes the different species of cattle, sheep, goats, swine, horses, asses, camels, llamas and alpacas, bison, buffaloes, reindeer, cats, and elephants, with special reference to those which have been domesticated.

Curing meat on the farm, H. H. Smith (*Colo. Agr. Col. Ext. Bul. 211 A (1923), pp. 12, figs. 6*).—Popular directions for the home curing of meats.

A textbook of cattle production, J. Hansen (*Lehrbuch der Rinderzucht. Berlin: Paul Parey, 1922, 2.-3. ed., rev., pp. XVI+647, figs. 316*).—This is an extensive text on the production, judging, feeding, and breeding of dairy and beef cattle, containing sections on the species of cattle, conformation, breeds of the United States and the various European countries, and feeding and management.

A study of the breeding of the races of Breton cattle in Finistère, R. Buquet (*Essais sur l'Élevage des Races Bovines Bretonnes en Finistère. Thesis, École Supér. Libre Agr., Toulouse, 1923, pp. 56*).—This consists of a study of the types of cattle and methods of breeding, with reference to the economic and geographical conditions in the region.

Oat silage vs. sunflower silage for fattening steers, J. P. Sackville and J. E. Bowstead (*Alberta Univ., Col. Agr. Bul. 8 (1924), pp. 26, figs. 4*).—The results are reported of three experiments in comparing oat silage with sunflower silage for fattening steers. The tests were conducted during the winters of 1920, 1921, and 1922. The oat silage was cut in the early dough stage except for part of the 1922 crop. The sunflowers were cut when from 3 to 20 per cent in bloom. In addition to full feeding the silage, the ration contained a grain mixture of barley and oats, 2:1, oil meal, and hay, the latter consisting of prairie hay in the first and second and oat hay in the third experiments. Two-year-old steers were used as the experimental animals. The results are summarized below:

Oat versus sunflower silage for steers

Experiment	Lot	Length of experiment	Average initial weight	Average daily gain	Feed per 100 pounds gain					Selling price per 100 pounds
					Silage		Hay	Grain	Oil meal	
					Oat	Sunflower				
		Days	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	
1920	1	140	936	2.16	1,706		95	418	37	$7.77
1920	2	140	959	2.11		1,919	161	559	38	7.94
1921	1	140	978	2.52	1,092		94	400	40	5.81
1921	2	140	986	2.07		1,500	115	550	48	5.71
1922	1	135	976	2.76	1,103		199	407	35	5.81
1922	2	135	983	2.66		1,267	206	466	37	5.76

In each of the three trials the oat silage lot made more rapid gains and not only required less silage but also less grain and hay per unit of gain. The calculated net profit from the operation was greater in each case for the steers receiving oat silage.

Steer feeding in Alberta, J. P. SACKVILLE, J. E. BOWSTEAD, and R. D. SINCLAIR (*Alberta Univ., Col. Agr. Circ. 3* (*1924*), *pp. 24, figs. 4*).—The conditions attending the feeding of steers in Alberta are discussed.

Sheep production, L. V. STARKEY (*Clemson Agr. Col. S. C., Ext. Bul. 66* (*1924*), *pp. 32, figs. 22*).—A popular discussion of the care and management of sheep.

Sheep management in southwest Virginia as shown by a survey of 100 farms, C. R. NOBLES (*Virginia Sta. Bul. 238* (*1924*), *pp. 20, fig. 1*).—This consists of a presentation of the analyses of data collected by the survey method from 100 representative sheep raisers in 10 prominent sheep-raising counties of southwest Virginia. The problems presenting themselves are discussed, and pertinent suggestions for improved lamb and wool production are given.

Scrub vs. purebred ram, A. E. DARLOW (*Oklahoma Sta. Bul. 151* [*1925*], *pp. 4, figs. 2*).—This reports brief results of the comparative use of a scrub and a purebred ram on grade ewes. The lambs produced by the half of the flock sired by the purebred ram averaged 8.85 lb. in weight at birth and 103.2 lbs. when ready for market in the early spring, while those sired by the scrub ram averaged 8.1 lbs. at birth and 95 lbs. when ready for market at the same time in the early spring. The quality of the lambs sired by the purebred ram was also somewhat better than the others. The economical advantage from using the purebred sire is briefly noted.

Feeding pigeon grass seed to fattening lambs, D. J. GRISWOLD (*Natl. Wool Grower, 14* (*1924*), *No. 12, p. 32*).—In a comparison of pigeon grass seed with barley for fattening lambs at the South Dakota Experiment Station, equal gains, 0.44 lb. daily, were made on grain mixtures of barley and wheat bran, 4:1, and pigeon grass seed, barley, and wheat bran, 2:2:1. A mixture of the pigeon grass seed and wheat bran, 4:1, proved somewhat inferior, the average daily gains being only 0.35 lb. daily and the feed requirements somewhat greater, though the calculated cost per 100 lbs. of gain was somewhat less during the test. After 37 days the experiment was continued for an additional 18 days, with similar results when the ration of barley and wheat bran was substituted for the ration of pigeon grass seed, barley, and wheat bran.

The soybean crop for fattening western lambs, W. G. KAMMLADE and A. K. MACKEY (*Illinois Sta. Bul. 260* (*1925*), *pp. 198–211, figs. 2*).—This bulletin reports the results of two experiments dealing with the feeding value of soy

bean products for fattening lambs. Brief results of the first experiment were previously noted (E. S. R., 52, p. 468).

Six lots of 25 lambs each were fed in both experiments, the average initial weights being slightly less than 60 lbs. in the first experiment and slightly more than 60 lbs. in the second experiment. The feeding periods were 96 and 84 days, respectively. All lots received shelled corn, with roughage of alfalfa hay and soy-bean hay, respectively, in lots 1 and 2. Soy-bean straw constituted the roughage of the other lots except in the second experiment when lot 4 received oat straw. One lb. of protein supplement was added per 4 lbs. of corn as follows: Lot 3 whole soy beans, lot 4 ground soy beans in the first experiment and soy bean oil meal in the second experiment, lot 5 soy bean oil meal, and lot 6 linseed oil meal.

The results, which are tabulated for each experiment, showed that the rations of shelled corn and alfalfa hay and shelled corn and soy-bean hay were superior in the rate of gain produced, the average daily gains produced by the former ration being 0.34 in the first and 0.32 lb. in the second experiment, while the latter ration produced average gains of 0.33 and 0.31 lb. in the first and second experiments. A slightly greater amount of soy-bean hay was required than alfalfa hay, probably due to the larger proportion of inedible matter in the former roughage.

The comparison of ground and whole soy beans, when fed with soy-bean straw, showed no advantage for grinding, and the feed requirements were slightly less with the whole grain. Linseed oil meal and soy bean oil meal were approximately equal in their ability to produce gains and in the feeds required. The oat straw group in the second experiment was the poorest finished of any of the lots, and more feed was required per 100 lbs. of gain. The authors have discussed the financial considerations to be taken into account when feeding soy-bean products to sheep.

The internal structure of wool: Its significance for sheep-breeders, A. H. Cockayne (*New Zeal. Jour. Agr., 29 (1924), No. 5, pp. 297–304, figs. 9*).—The results of a microscopical study of New Zealand wool, with special reference to the wool of Romney sheep, indicates that the presence of medullated fibers is tending to injure the reputation of New Zealand wool in foreign markets.

Productive swine husbandry, G. E. Day (*Philadelphia and London: J. B. Lippincott Co., 1924, 4. ed., rev., pp. X+364, pl. 1, figs. 89*).—This is a completely revised and slightly enlarged edition of the book previously noted (E. S. R., 47, p. 195).

A study of the dietary relationships and the pathology of "stiffness" in swine, L. A. Maynard, S. A. Goldberg, and R. C. Miller (*New York Cornell Sta. Mem. 86 (1925), pp. 3–34, pls. 4, figs. 3*).—The production of severe stiffness in pigs receiving a ration of yellow hominy feed and skim milk with access to a mineral mixture led to an investigation of the cause of such a condition.

A total of 95 pigs of Duroc, Berkshire, and Cheshire breeding were used in four experiments conducted during the winters and summers of 1922 to 1924. The rations as fed to the different lots consisted mainly of yellow hominy feed, or corn meal, and wheat middlings, with supplements in different lots of casein, raw and pasteurized milk, linseed oil meal, fish meal, cornstarch, precipitated bone meal, and calcium carbonate.

Twenty-three cases of stiffness developed somewhat irregularly and in certain cases unexpectedly. The general results indicated that the stiffness was associated with a calcium deficiency in the ration, but there was also an apparent relation to factors aiding calcium assimilation, since severe stiffness occurred in one trial when the pigs were receiving liberal calcium and phosphorus supplements. In one experiment an advantage was shown from sup-

plying the minerals in fish meal rather than as bone meal and ground limestone with oil meal. Six cases of stiffness were also alleviated by cod liver oil but not by orange juice. Adding limestone and bone meal to the ration cured the stiffness in 2 out of 3 cases in which it was tried.

Pathological studies were made of 38 of the experimental animals, including 23 cases of stiffness, and chemical analyses were made of the femurs of 9 pigs which were killed while on ample and efficient rations. The principal lesions in the stiff animals were associated with the long bones and included imperfect calcification, granulation tissue, degenerated areas of articular cartilage, osteoclasts along the trabeculae, and hemorrhage. The cortex of the kidneys was pale and the medulla was congested, and in more than half of the stiff animals there was subacute nephritis with a dilation of the collecting tubules and numerous petechiae on the kidneys and mucosa of the bladder.

The chemical analyses showed a marked reduction in the ash, calcium, and phosphorus contents of the long bones. Differences in individuality, prenatal mineral nutrition, conditions of sunlight, etc., are suggested as factors which influence the variability of the incidence of stiffness in different animals on similar rations.

Hogging down corn and soybeans, L. A. WEAVER (*Missouri Sta. Bul. 224 (1924), pp. 20, figs. 9*).—The results of five years' trials in hogging down corn and corn and soy beans with and without tankage as a self-fed supplement are summarized in this bulletin. That portion of the study dealing with the methods of planting, determination of yields, layout of plats, etc., has been previously noted (E. S. R., 52., p. 436).

The average results of the five years show that approximately 13 hogs were carried for from 21 to 22.6 days on 1 acre of the different crops. There was, however, considerable difference in the amounts of pork produced. The lots hogging down corn with access to tankage in a self-feeder produced an average of 518.8 lbs. of pork per acre, requiring 37.2 lbs. of tankage and 375.8 lbs. (estimated) of corn per 100 lbs. of gain. The lot hogging down corn and soy beans with tankage self-fed produced 478.2 lbs. of pork per acre, requiring 35.6 lbs. of tankage and 356.2 lbs. (estimated) of corn and 51.7 lbs. (estimated) of soy beans per 100 lbs. of gain. The lots hogging down corn and soy beans without supplements produced 303.15 lbs. of pork per acre, the estimated feed consumption per 100 lbs. of gain being 559.1 lbs. of corn and 81.9 lbs. of soy beans. The lot hogging down corn alone without supplement produced 276.25 lbs. of pork per acre and required 774.1 lbs. (estimated) of corn per 100 lbs. of gain. It was concluded that soy beans would partially but not entirely replace tankage as a supplement to corn hogged down.

Feeding pigs in a dry lot, W. E. JOSEPH (*Montana Sta. Bul. 169 (1924), pp. 52, figs. 18*).—The results are given of swine feeding experiments in dry lot conducted at this station from 1914 to 1921 and previously noted from annual reports. The summarized data indicate that hulless barley compares favorably with other grains as a basic feed, but supplements of skim milk, tankage, or alfalfa hay should be included in the ration. Bone meal is likewise beneficial in addition to the alfalfa hay. Soaking has been found to improve the value of whole barley, but it has not proved superior to ground barley.

Pork from farm by-products and pastures, C. M. HUBBARD (*Wash. State Col. Ext. [Bul.] 119 (1924), pp. 10*).—The practicability of producing pork from home-grown feeds and farm by-products is discussed, based on the results of investigations at the various experiment stations.

Home cured pork: Killing, dressing, and curing, P. E. Neale (*N. Mex. Agr. Col. Ext. Circ. 78 (1924), pp. 16, figs. 5*).—Directions for killing, dressing, cutting, and curing pork.

Feeding purebred draft fillies, J. L. Edmonds and C. W. Crawford (*Illinois Sta. Bul. 262 (1925), pp. 246–260, figs. 12*).—The results are reported of a 504-day experiment in growing 10 Percheron weanling fillies. One part of sheaf oats and 2 parts of alfalfa hay, with a grain mixture of 75 per cent of crushed oats and 25 per cent of bran were fed during the first winter, the average daily feed for the 140 days consisting of 4.77 lbs. of grain, 10.47 lbs. of alfalfa hay, and 4.93 lbs. of sheaf oats. During this time the fillies made average gains in live weight of 200 lbs. and in height of 3.23 in. Sweet clover pasture was supplied from April 30 to August 13, followed by blue grass pasture to December 17. Some of the grain mixture was supplied while on pasture, and during the latter part of the pasture period sheaf oats and alfalfa hay were furnished. The gain while on pasture was 221.5 lbs. in weight and 2.8 in. in height. Sheaf oats and alfalfa hay were fed in equal amounts during the second winter of 196 days, when the average gains made were 143.5 lbs. in live weight and 1.23 in. in height.

The cost of feeding fillies is discussed, and the results of three earlier experiments in horse feeding summarized (E. S. R., 36, p. 569; 46, p. 369).

Popular breeds of domestic poultry, American and foreign, J. H. Robinson (*Dayton, Ohio: Rel. Poultry Jour. Pub. Co., 1924, pp. 352, pl. 1, figs. 300*).—This consists of histories and descriptions of the various breeds of fowl, turkeys, guineas, ducks, and geese, with illustrations by F. L. Sewell.

The scientific principles of artificial incubation, L. B. Atkinson (*Jour. Roy. Soc. Arts, 73 (1924), Nos. 3758, pp. 37–55; 3759, pp. 62–82, figs. 2*).—This is a discussion of the heat production and transfer, ventilation, and humidity regulation in artificial incubators with reference to the factors affecting them. The biological aspects of hatching are also reviewed.

Feeding the chicks, D. C. Kennard and R. M. Bethke (*Ohio Sta. Mo. Bul., 10 (1925), No. 1–2, pp. 26–30*).—A description of the feed requirements of baby chicks and young pullets, pointing out the necessity of including all the different portions of the ration.

Raising chicks at a profit, J. Vandervort (*Illinois Sta. Circ. 294 (1925), pp. 15, figs. 5*).—Popular directions for the brooding, feeding, and management of chicks.

The influence of animal and vegetable proteins on egg production, H. L. Kempster (*Missouri Sta. Bul. 225 (1924), pp. 16, figs. 5*).—This bulletin presents a summary of investigations of the comparative values of various kinds and amounts of animal and vegetable proteins for egg production conducted from 1914 to 1923. Much of the material presented has been previously noted in annual reports (E. S. R., 51, p. 776). The summarized comparisons of animal proteins showed little choice between additions per hen per year of 6.6 lbs. of meat scrap, 5.8 lbs. of tankage, and 11.5 lbs. of dried buttermilk, or sour milk ad libitum as all practically doubled the production of the check pens receiving no animal protein.

The averages of several years' comparisons of mashes containing 5, 10, 15, 20, 25, and 34 per cent of meat scrap or tankage in the mash showed that the maximum egg production was attained with mashes containing 25 or 34 per cent of animal protein, though mashes containing 20, 15, 10, and 5 per cent of meat scrap or tankage were calculated as 96.3, 94.5, 93.9, and 89.9 per cent, respectively, as efficient. The check mash containing no animal protein was

only 55.9 per cent as efficient. Mashes containing from 15 to 25 per cent of meat scrap or tankage are recommended for practical use. A correlation of 0.5179±0.071 was calculated between the amount of meat scrap or tankage consumed per hen and the annual egg production, based on the results of 48 trials.

Studies of the value of vegetable proteins in continuation of those previously noted (E. S. R., 39, p. 577) have given equally unsatisfactory results.

Importance of green feed for poultry, W. H. ALLEN (*New Jersey Stas. Hints to Poultrymen, 13 (1925), No. 7, pp. 4, fig. 1*).—A discussion of the reasons for feeding green feed to poultry, with reference to their vitamin contents and suggestions as to the more desirable green feeds to grow.

Turkey raising, C. X. BURGOS (*Philippine Agr. Rev., 17 (1924), No. 3, pp. 157–166, pls. 3, fig. 1*).—The type of turkey found in the Philippine Islands is described, and the methods of care, feeding, and management of turkeys are discussed.

DAIRY FARMING—DAIRYING

Milk secretion, J. W. GOWEN (*Baltimore: Williams & Wilkins Co., 1924, pp. 363, figs. 30*).—This volume reports a series of investigations which have been conducted at the Maine Experiment Station, dealing primarily with an analysis of the inheritance of milk production and butterfat percentage in Holstein-Friesian cattle, and based largely on statistical studies of the Advanced Registry records of the Holstein-Friesian Association.

I. *The characteristics of Holstein-Friesian milk yield* (pp. 13–23).—In this chapter the composition of the milk of the dairy breeds and various classes of animals is compared with Holstein-Friesian milk.

II. *Characteristics of modern Holstein-Friesian pedigrees* (pp. 24–31).—A comparative study of the pedigrees of 48 sires whose daughters have high milk yield, 29 sires whose daughters have low milk yield, 22 sires whose daughters are high in butterfat percentage, 22 sires whose daughters are low in butterfat percentage, and 33 sires whose daughters or sons have no Advanced Registry records indicated much similarity between them. The inbreeding and relationship of the parents during the first four generations, as determined by Pearl's coefficients, were small on the average.

III. *Conformation in relation to 7-day milk yield and butterfat percentage* (pp. 32–49).—Based on correlation coefficients between the 7-day lactation records and certain body measurements in 385 cows reported in the early volumes of the Advanced Register, it was found that the body parts, shoulder height, hip height, body length, rump length, body width, thurl width, body girth, and weight have a fair degree of correlation with milk yield even when the age is made constant by the method of partial correlations, but no correlation was observed between these parts and the butterfat percentage of the milk.

IV. *Age of the cow and its influence on her milk yield, milk solids, and milk solids percentage* (pp. 50–77).—For this study a statistical analysis has been made of 2,586 complete 365-day and 21,569 7-day records as given in the Advanced Register. Equations and curves express the relation of the milk yield, butterfat, solids-not-fat, butterfat percentage, and solids-not-fat percentage to the age of the cow. Means of determining equivalent production from the yields at another age are suggested.

V. *Mode of secretion of milk and milk solids* (pp. 78–87).—A statistical study of the relation between the milk yield, solids-not-fat, butterfat, and age has

pointed out the close relation between milk yield and the solids-not-fat in Holstein milk, indicating that the solids-not-fat are the controlling factor in milk yield.

VI. *The permanence of a cow's milk yield or butterfat percentage* (pp. 88–118).—This study is similar to the one previously noted, with some additions (E. S. R., 49, p. 174). The 365-day and 7-day records are shown to be quite reliable indicators of future production, while scores or other indicators of production are less accurate.

VII. *Pedigree promise and the performance of Holstein-Friesian Advanced Registry cows in milk yield and butterfat percentage* (pp. 119–130).—Based on a study of the pedigrees noted in Chapter II, it is shown that any given cow or bull may appear in the pedigree of a bull of any of the classes of production with almost equal frequency. Popularity or some other factor is apparently more influential in determining an animal's presence in the pedigree than true worth, especially back in the third or fourth generation.

VIII. *Analysis of the stringency of selection as exerted by the Holstein-Friesian Advanced Registry requirement* (pp. 131–141).—Determinations of the analytical constants for milk yield and butterfat percentage of the 365-day Advanced Registry records and comparisons with constants for random records of Jerseys and Ayrshires indicated that practically all purebred cows of the Holstein-Friesian breed, if tested, could meet the Advanced Registry requirements. The butterfat percentages of the recorded Holsteins are not greatly different from a random sample. It is pointed out, however, that the analysis of similar data by other authors has indicated the operation of some selection among Advanced Registry animals.

IX. *On the relation of the milk yields of a sire's daughters' full sisters* (pp. 142–152).—The 365-day records of 302 pairs of full sisters listed in volumes 18 to 31 of the Advanced Register Year Book were studied as to the evidence of inheritance of milk production. The correlation between the production of these sisters was high, 0.548±0.027. Calculations were also made showing the expected average and range of the production to include 50 and 99 per cent of the full sisters of an individual of known production.

X. *The milk yields of half sisters as a measure of the influence of the sire on milk production* (pp. 153–175).—This is a study similar to the above of the relationships between the 365-day milk records of half sisters having the same sire. The correlation coefficient for the milk yields of the half sisters was lower than for full sisters, 0.362±0.015. The sire is shown to be responsible for approximately 50 per cent of the inheritance of the daughter.

XI. *The butterfat percentage of full sisters* (pp. 176–186).—This is a study of the relation between butterfat percentages of the milk of full sisters, previously treated in Chapter IX, as to their milk production. The correlation coefficient was 0.464±0.032. The expected average and range for the butterfat percentages of a full sister of an animal of known production have been calculated.

XII. *The correlations and variations in the butterfat percentage of a sire's daughters.—Half sisters* (pp. 187–209).—The correlation coefficient between the butterfat percentages of milk of half sisters having the same sire was 0.374±0.015. The expected average and range of butterfat percentage of half sisters have likewise been calculated. The sire and dam were shown to have an approximately equal effect on the butterfat percentages of their daughters.

XIII. *On the relation of the milk yields of mother and daughter in the Holstein-Friesian Advanced Registry* (pp. 210–223).—A statistical study of the milk records of 611 daughters whose dams have 365-day records has shown

0.497±0.021. Calculations of the range of production for 50 and 99 per cent of the daughters of a cow of known production have been made, as well as the averages. Mature and immature cows were apparently equal in their ability to transmit milk production.

XIV. *The relation between the milk yields of cows from the same dam but by different sires.—Half sisters* (pp. 224–235).—The milk yields of daughters of the same dams sired by different sires showed a correlation of 0.381±0.033, which was similar to that of half sisters sired by the same sire. The expected average and ranges have also been calculated. This and other evidence further indicates the joint and equal influence of sire and dam on milk production.

XV. *On the relation between the butterfat percentage of mother and daughter* (pp. 236–248).—The dams and daughters in Chapter XIII were found to show a correlation of 0.413±0.023 between the butterfat percentages of their milk. The calculated average and ranges for daughters to include 50 and 99 per cent were tabulated.

XVI. *The relation between the butterfat percentages of cows from the same dam but from different sires.—Half sisters* (pp. 249–260).—A correlation of 0.221±0.036 between the butterfat percentages of the milk of half sisters having the same dam was calculated. The average and ranges for the butterfat percentage of half sisters of a known animal were calculated.

XVII. *On the relation between the milk yield of the daughter and the butterfat percentage of the dam or between the butterfat percentage of the daughter and the milk yield of the dam* (pp. 261–266).—The correlation coefficients for these cross relations were, respectively, 0.070±0.027 and 0.034±0.027, thus no foundation for the reciprocal relation between the fat percentage and milk yield is given. It also indicates that heredity is the important factor in production rather than environment.

XVIII. *Assortive mating in the Holstein-Friesian breed* (pp. 267–277).—The evidence presented in this study was based on the records of 124 dams and their paternal granddams and 51 paternal and maternal granddams. The paternal granddams' milk yields slightly excelled those of the dams. The correlation coefficients were determined as follows: Milk yields of dam and paternal granddam 0.142±0.059 and butterfat percentages of dam and paternal granddam 0.001±0.061, and milk yields of paternal and maternal granddams 0.296±0.086 and butterfat percentages of paternal and maternal granddams 0.040±0.094. These indicate selective breeding of cows having high milk yields with sires whose dams have high milk yields. A small indication for the selection of cows whose dams have high milk yields was also indicated. Thus, there is some degree of assortive mating for milk yield but practically none for butterfat percentage.

XIX. *The relative influence of environment and heredity on the milk yields and butterfat percentages* (pp. 278–298).—The records of the cows in 74 herds were analyzed in studying the effect of environment. The correlation coefficient between the milk yields and the herds was 0.603±0.011 and the butterfat percentages 0.490±0.013. When the effect of the individual herd is eliminated by partial correlations, the cofficients for full sisters were 0.544±0.035 for milk yield and 0.436±0.040 for butterfat percentage. Similar results were obtained for dams and daughters. These determinations indicate the relatively small part played by environment and the large part played by heredity in the determination of milk yields and butterfat percentages. Similar conclusions were drawn from the records of half sisters having the same sire or the same dam, though in the latter case they were not as pronounced. The proportionate effect of the measured heredity and environment depends on

XX. *The inheritance of milk yield and butterfat percentage from paternal grandsire to granddaughter* (pp. 290–307).—An association between the milk yields and butterfat percentages of granddaughters and of cousins having the same paternal grandsire was demonstrated. The correlations for milk yield were 0.070±0.014 for granddaughters and 0.005±0.029 for cousins, and for butterfat percentage 0.176±0.014 for granddaughters and 0.119±0.029 for cousins. The correlation coefficients between the standard deviation of the grandsire's granddaughters and the standard deviation of all the milk yields of all the granddaughters were 0.245 for milk yield and 0.389 for butterfat percentage. It is thus evident that milk yield and fat percentage are inherited from grandsire to granddaughter, but only about one-half as much as from parent to daughter.

XXI. *Influence of the paternal granddam on the milk yields and butterfat percentages of her granddaughters* (pp. 308–317).—In this study the correlation coefficients indicating a relationship between the milk yields and butterfat percentages of granddams and granddaughters were, respectively, 0.297±0.014 and 0.336±0.014. The correlation coefficients for cousins were 0.171±0.045 for milk yield and 0.214±0.044 for butterfat percentage. The correlation coefficients for the granddams' and granddaughters' productivity were 0.258±0.038 for milk yield and 0.091±0.040 for butterfat percentage. The paternal granddam was about equally important with the paternal grandsire in determining the granddaughters' production, about 0.2 to 0.25 being the correlation measurement in each case.

XXII. *Influence of the maternal grandsire on the milk yields and butterfat percentages of his granddaughters* (pp. 318–325).—The correlations determined in this study were for granddaughters of a maternal grandsire 0.244±0.016 for milk yield and 0.224±0.016 for butterfat percentage and for cousins having the same maternal grandsire 0.206±0.020 for milk yield and 0.216±0.020 for butterfat percentage. Application of the method of average standard deviation of arrays of granddaughters of each grandsire to the standard deviation of all the granddaughters indicated a coefficient of 0.350 for milk yield and 0.390 for butterfat percentage between the maternal grandsires and granddaughters. The maternal grandsire is thus only about one-half as important in controlling the milk yield and butterfat percentage as the sire or dam.

XXIII. *The influence of the maternal granddam on the milk yields and butterfat percentages of her granddaughters* (pp. 326–336.).—This chapter consists of a study of the milk yields and butterfat percentages of granddaughters having the same maternal granddam, the correlations determined being for granddaughters 0.344 ± 0.021 for milk yield and 0.258 ± 0.022 for butterfat percentage, for cousins 0.234 ± 0.044 for milk yield and 0.244 ± 0.044 for butterfat percentage, and for granddams and granddaughters 0.307 ± 0.047 for milk yield and 0.192 ± 0.050 for butterfat percentage. This again shows the influence of the grandparent (maternal granddam) to be only about one-half that of the parents.

XXIV. *Résumé of the present data on the inheritance of milk yield and butterfat percentage* (pp. 337–356).—The results of the preceding studies are discussed with relation to practical breeding operations and the cytological evidence of inheritance. The crossbreeding results of Holstein-Friesian, Jersey, Guernsey, and Aberdeen-Angus cattle obtained at the station are mentioned, and it is noted that intermediate F_1 offspring seem to be the rule in crosses of breeds having high or low milk or high or low fat production characteristics.

were used in studying the method by which garlic flavor enters milk and the length of time required for its entrance and disappearance. The determinations of the garlic flavors and odors in the milk were made as in the earlier experiments of this nature (E. S. R., 52, p. 578).

In this experiment the check cows showed an average of over 20 per cent garlic flavor and odors of various degrees. This condition was found to be largely due to milk from cows standing beside cows receiving the garlic. In the experimental feeding the cows received ½ lb. of garlic tops per head, and samples of milk were drawn at intervals of 1, 3.5 to 5, 6 to 7, and 10 to 10.5 minutes after the feeding. The samples drawn at the shortest interval after feeding had only slight garlic flavor and odor, and 31.3 per cent of the samples in each case were normal. As the time increased the percentage of normal samples decreased, and a strong garlic odor was found in 80 per cent of the samples after 10 minutes.

In testing the length of time required for the flavor and odor to disappear, cows were fed ½ lb. of garlic at intervals of 4, 5, 6, and 7 hours prior to milking. There were no normal samples of milk produced at 4 hours after feeding, but the percentage gradually increased, there being 7.1, 30, and 91.7, respectively, of normal samples at 5, 6, and 7 hours after milking. The 71.4 per cent of the samples having a strong garlic flavor and odor at 4 hours decreased to 0 at 7 hours.

In a study of the effect of garlic inhalation for 10 minutes, it was found that all the samples of milk drawn 2 minutes after the inhalation were rated as having a strong or slight garlic flavor and odor. This was gradually decreased and the percentage of normal milk increased, until at 90 minutes after the inhalation 75 per cent of the samples were normal and none had a strong garlic flavor or odor. Odors of garlic were detected from the blood of cows 30 and 45 minutes after feeding 2 lbs. of garlic, but no odors were noted 16 minutes after the feeding.

Feeding the dairy herd, C. H. Eckles and O. G. Schaefer (*Minnesota Sta. Bul. 218 (1924), pp. 3–47*).—Popular directions for feeding dairy cattle with reference to the nutrient requirements and the values of the different feeds.

Soft cheeses that are easily made, E. F. Goss (*Iowa Sta. Circ. 94 (1924), pp. 7, figs. 6*).—Directions for the manufacture of pimento, olive Neufchâtel, sandwich nut, cream, skim milk Neufchâtel, cottage, buttermilk, and club cheeses.

The effect of different percentages of butterfat on the physical properties of ice cream, D. H. Nelson and W. H. E. Reid (*Missouri Sta. Research Bul. 70 (1924), pp. 3–24, figs. 20*).—This and the succeeding bulletin give the detailed results of the investigation previously noted from a brief report (E. S. R., 51, p. 780). The methods were similar to those used in an earlier study of the effect of the sugar content on the quality of ice cream (E. S. R., 52, p. 679). In conducting the experiments, mixes were frozen which were identical in all respects except for their fat content, which varied by multiples of 2 from 4 to 20 per cent fat, and one mix contained 25 per cent fat. All mixes were similarly frozen, a maximum overrun being attained in each case.

The physical properties of the ice cream were found to be affected by the changes in the fat content. Two per cent increases in fat decreased the specific gravity 0.004 but increased the viscosity, which was particularly pronounced with the larger amounts of fat. Increases in the fat content up to 10 per cent were accompanied by increased overrun, but further increases above 10 per cent resulted in a decreased overrun. The fat content apparently had no effect on the hardness of the ice cream, as determined by penetration, except

greater stability when exposed to summer temperatures. Ice cream containing 10 per cent of fat appeared to be the most satisfactory, as judged by its flavor, body, texture, appearance, richness, and ability to maintain a good quality in storage.

Effect of several ingredients used in the manufacture of commercial ice cream on the change in temperature during the freezing process, W. H. E. REID and D. H. NELSON (*Missouri Sta. Research Bul. 71 (1924), pp. 3–16, figs. 8*).—The effects on freezing processes of the content of milk solids-not-fat in the ice cream mix and when supplied from different sources have been investigated. Three series of mixes containing 6, 10, 12, 14, and 18 per cent solids-not-fat were prepared. Skim milk powder was used as the source of milk solids for the first series, whole milk powder for the second, and evaporated milk for the third series. A sherbet containing 4 per cent milk solids-not-fat and a water ice were also frozen for comparison.

Increases in the milk solids-not-fat content of the mix resulted in each case in an increase in the titratable acidity and in the viscosity, the former being due to the buffer action of the serum solids and the latter to the increased concentration of solids. Increases in the solids-not-fat content lowered the freezing and crystallization points and increased the time required for freezing, but the amount of supercooling was not affected by any of the resulting changes. Ice cream containing the higher contents of milk solids-not-fat melts more rapidly but is more stable than that containing less solids-not-fat.

The results of the study are tabulated and presented graphically.

VETERINARY MEDICINE

Laboratory diagnostic methods, J. A. KOLMER and F. BOERNER (*New York and London: D. Appleton & Co., 1925, pp. XXI+338*).—This laboratory manual consists of the clinical pathological, bacteriological, serological, and chemical methods employed in the department of pathology and bacteriology of the Graduate School of Medicine in the University of Pennsylvania and the hospitals connected with it. Section 1 on clinical pathological methods includes methods for the examination of blood, urine, gastric contents, bile and duodenal fluids, feces, sputum, cerebrospinal fluid, and human milk. The other sections deal, respectively, with clinical bacteriological, serological, and blood chemistry methods. For most of the determinations in the analysis of the blood the methods of Folin and Wu are used.

Histological methods and the technique of the preparation of culture media are not included.

Nomina anatomica veterinaria (veterinary anatomical names), S. SISSON ET AL. (*[Detroit]: Amer. Vet. Med. Assoc., 1923, pp. 60*).—This is a list prepared by a committee of the American Veterinary Medical Association on the revision of the veterinary anatomical nomenclature, which has been adopted by the association. It is pointed out that this is not a new nomenclature, and that the number of new names in it is so small as to be practically negligible.

Infection, immunity, and inflammation, F. B. GURD (*St. Louis: C. V. Mosby Co., 1924, pp. 329*).—In this volume the phenomena of hypersensitiveness and tolerance are discussed in their relationship to the clinical study, prophylaxis, and treatment of disease. The author's hypothesis concerning the relationship of hypersensitiveness or anaphylaxis to tolerance or immunity is as follows:

"The parenteral introduction of heterologous proteins into the animal body is followed by the elaboration by certain tissue cells of specific antibodies which

consequence of the presence in the tissues of this anaphylactic antibody, the animal is hypersensitive to the reinjection of the specific protein as the result of whose primary injection the production of the antibody was stimulated. Subsequent parenteral introduction of the same antigen in sublethal doses results in the stimulation of the production of a second order of antibody which is potent so to alter the irritant which arises from the reaction between the antigen and the first order body as to render it innocuous to the body cells."

Immunization experiments with germ-free filtrates and with culture *dilutions of the edema bacillus (R. Koch)* [trans. title], G. Sobernheim and K. Imanishi (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 27 (1924), No. 3, pp. 161–170*).—Three series of attempts to secure immunity in guinea pigs against the bacillus of malignant edema by the use of germ-free filtrates are reported, with negative results in all but a few cases. Similar experiments with blackleg filtrates resulted in immunity in nearly every case. Equally unsatisfactory results were obtained with culture dilutions of the bacillus of malignant edema.

White snakeroot poisoning (trembles or milk sick), R. Graham and I. B. Boughton (*Illinois Sta. Circ. 295 (1925), pp. 7, figs. 4*).—This is a brief summary of information on trembles, which is caused by white snakeroot. Reports of studies of this plant at the North Carolina Station (E. S. R., 39, p. 489) and the Indiana Station (E. S. R., 50, p. 181) have been noted.

Report of the proceedings of the twenty-sixth annual meeting of the United States Live Stock Sanitary Association (*U. S. Livestock Sanit. Assoc. Rpt., 26 (1922), pp. 158*).—This report of the proceedings of the annual meeting at Chicago in December, 1922, includes the following papers: Organizing Counties for Bovine Tuberculosis Eradication, by W. Moore (pp. 16–19); Tuberculosis Eradication in California, by J. P. Iverson (pp. 20–22); The Necessity of State and Federal Government's Recognition of the Accredited Practicing Veterinarians in the Control of Bovine Tuberculosis, by J. G. Ferneyhough (pp. 22–24); Observations Made in Intradermic Tuberculin Testing, by J. R. Kiernan (pp. 24–26); Summary of the Developments in the Prevention and Eradication of Bovine Tuberculosis in Pennsylvania during the Past Thirty Years, by S. E. Bruner (pp. 26–39); Some Things Overlooked by Federal and State Officials in the Eradication of Tuberculosis, by C. E. Snyder (pp. 40–43); Proper Time and Kind of Retest for Herds that Disclose Tuberculous Animals, by J. S. Healy (pp. 43–46); experiments in connection with animals in which no lesion is found on a post-mortem, after they have given a definite reaction to tuberculin, by L. E. Day (pp. 46–48); Some Phases of Sanitation in the Control of Swine Diseases, by L. Van Es (pp. 57–62); Report of Committee on Hog Cholera Control, by C. H. Stange et al. (pp. 62–65); Report of the Committee on Interstate Shipment of Swine, by U. G. Houck et al. (pp. 66–70); The Practical Control of Infectious Abortion in Cattle Herds, by J. W. Connaway (pp. 78–86); The Importance of the Sequelae of Abortion Disease, by J. F. De Vine (pp. 86–88); Facts Concerning the Etiology of Abortion Disease in Cattle, by R. R. Birch (pp. 88–91); Report of the Committee on Abortion, by C. P. Fitch et al. (pp. 92–94); Report of the Committee on Livestock Diseases, by J. Traum et al. (pp. 107–116); Report of the Committee on Bovine Tuberculosis, by M. Jacob (pp. 122–129); Report of the Special Committee on Foot-and-mouth Disease, by J. H. McNeil et al. (pp. 132–135); Tick Eradication Work in Texas, by H. M. Grafke (pp. 138–143); Why Florida Stands Alone in Tick Eradication, by J. V. Knapp (pp. 143–145); Report of the Committee on Tick Eradication, by C. A. Cary et al. (pp. 145–150);

Proceedings of the second meeting of the veterinary officers in India, held at Calcutta from 26th February to 2nd March, 1923 (*India* [*Dept. Agr.*] *Proc. Meeting Vet. Off.*, *2* (*1923*), *pp. II+143*).—The first part of this report (pp. 10–44) deals with education, the second part (pp. 45–98) with epizootic diseases, and the third part (pp. 99–132) with general matters, including legislation, statistics, etc.

Annual report for 1923 of the principal of the Royal Veterinary College, J. McFadyean (*Jour. Roy. Agr. Soc. England*, *84* (*1923*), *pp. 336–347*).—This annual report deals with the occurrence of infectious and parasitic diseases, including anthrax, glanders, sheep scab, hog cholera, parasitic mange in horses, swine erysipelas, and foot-and-mouth disease.

Contributions to the experimental study on the preparation of the blackleg precipitin serum [trans. title], Y. Kawamura (*Jour. Japan. Soc. Vet. Sci.*, *3* (*1924*), *No. 2*, *pp. 113–125*).—The author finds that the precipitin reaction is serviceable for differentiation of *Bacillus chauvoei* from *B. oedematis maligni*, *B. tetani*, *B. welchii*, and the bacillus of chicken diarrhea.

The cause of foot-and-mouth disease [trans. title] (*Berlin. Tierärztl. Wchnschr.*, *40* (*1924*), *No. 47*, *pp. 661–663*; *abs. in Jour. Compar. Path. and Ther.*, *37* (*1924*), *No. 4*, *pp. 302–306*).—This is a report by H. A. Gins (pp. 660, 661) for the commission appointed to examine the possibility of cultivating the virus of foot-and-mouth disease by the method described by Frosch and Dahmen, previously noted (E. S. R., 52, p. 179), and an explanation of the report by the latter authors (pp. 662, 663).

The differentiation of homologous and heterologous foot-and-mouth disease immune serums in guinea pigs [trans. title], O. Graf (*Arch. Wiss. u. Prakt. Tierheilk.*, *50* (*1924*), *No. 6*, *pp. 565–574*).—This paper reviews recent literature on immunization against foot-and-mouth disease, and reports experimental immunization studies conducted on guinea pigs, using mixed convalescent serum from guinea pigs and for comparison Loeffler's immune serum from cattle.

The former serum had a titer of 0.1 cc. and the latter of 0.2 cc., these figures representing the amount required to prevent generalization of symptoms in guinea pigs inoculated with a fixed amount of virus. It was found that the homologous serum, when injected into guinea pigs in double the amount of the titer, was eliminated after 5 days and in six times the titer in 15 days. With the other serum the elimination was complete in 2 days after the injection of double the titer and in not more than 3 days after the injection of six times the original dose. This indicates that the protection is of much longer duration in the case of the homologous than of the heterologous serum.

It is concluded that in spontaneously susceptible animals an effective serum prophylaxis can be obtained only with serum of the same species. In full grown cattle a passive immunity for 8 days results from the injection of 200 cc. and for 14 days of 300 cc. of serum.

The Fermi method of vaccination and serum antirabic vaccination compared with all other existing methods, C. Fermi (*I Metodi Fermi di Vaccinazione e di Sierovaccinazione Antirabbica Confrontati con Tutti gli Altri Metodi Esistenti. Milan: Istituto Sieroterapico, 1924, pp. 146*).—The author's method of antirabic treatment (E. S. R., 37, p. 480) is described in detail and compared in technique and results with the Pasteur and various other methods of antirabic treatment. *References to the original literature on the various methods are given as footnotes.*

Preventive antirabic vaccination in dogs [trans. title], V. Puntoni (*Clin. Vet.* [*Milan*], *47* (*1924*), *No. 11*, *pp. 637–643*).—This is a review and critical dis-

animals against rabies. In the author's opinion, the method of Umeno and Doi, as described by Eichhorn and Lyon (E. S. R., 47, p. 385), is superior to that of Fermi noted above, and if adopted as official in Italy would in time eradicate the disease.

The control of rabies in Connecticut, G. E. CORWIN (*Amer. Jour. Pub. Health, 14 (1924), No. 8, pp. 688–692*).—This is a discussion of the methods of control employed in Connecticut and the results obtained.

Tick eradication, P. F. BAHNSEN (*Ga. Dept. Agr. Quart. Bul. 95 (1924), pp. 46–75*).—This is a report of tick eradication work conducted in Georgia by the State veterinarian. Details of the work in the various counties, month by month, are presented in tabular form.

Comparative studies on the diagnostic value of the conjunctival and palpebral reactions in bovine tuberculosis [trans. title], H. TEIPEL (*Arch. Wiss. u. Prakt. Tierheilk., 50 (1924), No. 6, pp. 551–557*).—In three series of tests involving 52 cattle, the palpebral tuberculin test (subconjunctival, subcutaneous, and intracutaneous) gave positive results in 34 cases, and on slaughter 32 of these proved to be tuberculous, 1 doubtful, and 1 negative; of 17 with negative reactions, 15 proved negative and 2 tuberculous, and the 1 case giving a doubtful reaction gave negative results. The percentage of failures in diagnosis, including the doubtful case, was 9.6 per cent.

Using the conjunctival test on the same animals, 18 of the 20 reacting positively proved to be tuberculous on slaughter, 1 nontuberculous, and 1 doubtful; of the 29 negatively reacting animals, 15 proved to be tuberculous and 14 nontuberculous; and of the 3 with doubtful reactions, 1 was positive and 2 negative, making in all a failure of 38.5 per cent.

In discussing the relative value of the different tests, arguments advanced in favor of the conjunctival test are its rapidity and simplicity and against the test the possibility of removing intentionally or otherwise the secretion which is the positive sign. In the palpebral test, removal of evidence is not possible, but the test is more complicated and is followed by more serious aftereffects, such as loss of appetite and decrease in milk production. The conjunctival test is recommended for all cases except those in which the possibility must be considered of the removal of the evidences of reaction.

Protective inoculation against tuberculosis with killed tubercle bacilli [trans. title], H. LANGER (*Klin. Wchnschr., 3 (1924), No. 43, pp. 1944–1947*).—A possible means of immunizing children against tuberculosis is suggested as the result of experiments conducted on 20 guinea pigs and 10 young children. A vaccine prepared from tubercle bacilli killed by heat and treated with phenol was injected into guinea pigs intracutaneously and its effect tested by tuberculin. The injections were followed in each case by sensitiveness to tuberculin, which was increased by a further injection of old tuberculin. Similar results were obtained with the children. The sensitiveness to tuberculin thus induced is considered to be due to the establishment of immunity.

Avian tuberculosis in a marsupial, N. S. LUCAS (*Jour. Path. and Bact., 28 (1925), No. 1, pp. 123, 124*).—A brief account is given of avian tuberculosis in a rufous rat-kangaroo received in London from New South Wales.

Infectious abortion in cattle (sixth report).—Methods of conducting the agglutination and complement fixation tests, and their diagnosic value, L. F. RETTGER, J. G. MCALPINE, and G. C. WHITE (*Connecticut Storrs Sta. Bul. 125 (1924), pp. 3–23*).—This report, in continuation of the series previously noted (E. S. R., 52, p. 681), describes in detail the methods employed by the authors in routine complement fixation and agglutination tests for bovine infectious abortion and presents tabulated data showing [illegible]

period of 10 years, (2) close correlation between the two tests during the same period, and (3) agreement in the serological tests in a number of animals tested at frequent intervals for several months.

It is concluded that, if attention is paid to the production of a potent antigen and to the technique of the tests, the methods may be applied satisfactorily in the diagnosis of infectious abortion. Both methods are considered of equal importance, each serving as a valuable check for the other.

Comparative investigations on the reliability of the complement fixation test with active and inactive sera and of the agglutination test for the diagnosis of bovine infectious abortion [trans. title], J. WITTE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 27 (1924), No. 3, pp. 207-217*).—The general conclusions drawn in a comparison of the results obtained in the diagnosis of infectious abortion in cattle by the use of the complement fixation test with active and inactive sera and by the agglutination test are as follows:

The agglutination test for infectious abortion gives clear-cut results agreeing closely with the complement fixation test. On account of the fact that a few sera giving negative or doubtful results with the agglutination test were positive with the complement fixation test a combination of the two tests is recommended. While the results obtained with active and inactive sera were in general agreement, the use of active serum is thought to have the advantage over inactive in that the danger of so-called complement deviation is avoided, there is closer agreement with the agglutination test, nonspecific hemolysis with hemolytic sera does not occur, and time is not lost in inactivating the serum.

On the infectious abortion of mares in Kamikita district, Aomori Prefecture, Japan, N. KII, S. SATO, Y. NAKAMURA, and K. TAGUCHI (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 2 (1923), pp. 89, 90*).—The authors' abstract of the paper, previously noted from another source (E. S. R., 49, p. 283), is here presented.

A contribution to the knowledge of the pathological changes of the red blood cells in infectious anemia of the horse [trans. title], M. NAGAO (*Jour. Japan. Soc. Vet. Sci., 3 (1924), No. 2, pp. 99-111*).—Details of the author's investigations are presented in tabular form.

Studies on avian diphtheria.—The Schick reaction in the fowl [trans. title], L. PANISSET and J. VERGE (*Compt. Rend. Soc. Biol. [Paris], 92 (1925), No. 1, pp. 7, 8*).—Evidence that human and avian diphtherias are not identical is afforded by the results reported in an application of the Schick test to fowls. Healthy fowls with negative Schick test proved susceptible to the virus of avian diphtheria, while fowls cured of avian diphtheria and giving a positive Schick test proved susceptible to the virus of human diphtheria.

An anaemia in hens associated with an increase in the yellow pigment normally present in certain tissues of these birds, S. P. BEDSON and E. KNIGHT (*Jour. Path. and Bact., 27 (1924), No. 3, pp. 239-248, pl. 1*).—An account is given of anemia in fowls that is associated with an increased yellow pigmentation of those tissues that are normally pigmented. The pigment present in the serum of the diseased birds appeared to be a lipochrome, probably xanthophyll.

"This increased pigmentation is associated with an increase in the ether-extractable material (fats and lipoids) of the serum, and apparently the degree of pigmentation varies directly with the increase in fats and lipoids. This disease in fowls may be mild and of short duration, and remissions with a return to health and a normal blood picture are not uncommon. No organism has been isolated from the diseased birds by ordinary cultural methods and

hens (13), guinea pigs (2), and pigeons (1), using whole blood, plasma (filtered), and emulsions of liver and spleen (filtered and unfiltered), gave positive results in 3 of the hens, 2 inoculated with whole blood and 1 with liver emulsion "unfiltered." The possible identity of the disease with the anemic type of fowl leucosis described by Ellermann (E. S. R., 49, p. 81) is discussed.

Blood agglutination tests on adult fowls in respect of "bacillary white diarrhoea" or infectious septicaemia of young chicks, E. KNIGHT (*Jour. Path. and Bact., 27 (1924), No. 3, pp. 231, 232*).—Agglutination tests for *Bacillus pullorum* were conducted on fowls of four different farms and the findings compared with the hatchability of the eggs of the reactors and nonreactors. A summary of the agglutination results is given in the accompanying table.

Summary of agglutination tests

Birds tested: Location		Birds tested: Number	Positive 1:400	Positive 1:100	Negative
			Per cent	*Per cent*	*Per cent*
Farm I		115	45.00	18.5	36.50
Farm II		54	41.00	15.0	44.00
Farm III		104	18.25	10.5	71.25
Farm IV	males	68	.30	16.0	81.00
	females	155	15.00	6.0	79.00

In the first group the hatchability of the fertile eggs of the agglutinators was 75 and of the nonagglutinators 92 per cent. In regard to the second group, it was reported that the rearing percentage from negative birds varied from 60 to 95 and that there had been no white diarrhea during the season. In the third group the eggs from the negative birds hatched well and there was practically no mortality among the chicks, while from a single setting of the agglutinators' eggs only one chick was produced, and this was undersized and died in about six weeks. In the fourth group the death rate of the chicks from the negative hens was reported to be considerably lower than that from the agglutinators. In the dead chicks obtained from the agglutinators, *B. pullorum* was found in all cases, but it was not present in the dead chicks from the negative hens.

It is concluded that outbreaks of bacillary white diarrhea may be prevented by examining the blood of the birds in the breeding pens and removing those which give a positive agglutination reaction.

Newly discovered fowl plague in Japan (plague similar to "Hühner typhus") [trans. title], T. KONNO ([*Chosen*] *Govt. Inst. Vet. Research Rpt., 2 (1924), abs., pp. 4–6*).—This paper reports upon the discovery in Japan in 1922 of a disease resembling fowl cholera, which mainly attacks adult fowls, the course being usually subacute.

The cure and prevention of ear canker in rabbits, D. MARINE (*Science, 60 (1924), No. 1546, p. 158*).—The author reports that, in an extensive outbreak of ear canker in the laboratory, due to *Psoroptes cuniculi*, all rabbits were cured at the end of two weeks by spraying kerosene into the ear twice, with an interval of six days, using an atomizer.

AGRICULTURAL ENGINEERING

Flood flow characteristics, C. S. JARVIS (*Amer. Soc. Civ. Engin. Proc., 50 (1924), No. 10, [pt. 2], pp. 1545–1581, pl. 1, figs. 8*).—The characteristics of

must be considered in any preliminary studies for drainage are briefly stated, not by way of defining probable flood limits for individual cases but of indicating methods of deduction that must be followed. Available data which seemed reliable and valuable to the author are listed and platted to give a visual representation of the range of discharge per square mile for maximum recorded floods.

A method of approach is explained by which problems in several central and western districts have been solved satisfactorily, both as to flood prevention and property protection. In addition, a variety of representative basic and auxiliary data are presented in convenient form.

Daily river stages at river gage stations on the principal rivers of the United States, H. C. FRANKENFIELD (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 21 (1923), pp. II+188*).—This volume, containing the daily river stages for 1923, is the twenty-first of the series (E. S. R., 51, p. 85).

Surface water supply of Pacific slope basins in California, 1921 (*U. S. Geol. Survey, Water-Supply Paper 531 (1925), pp. VII+304, pls. 2*).—This report, prepared in cooperation with the States of California and Oregon, presents the results of measurements of flow made on streams in the Pacific slope basins in California during the year ended September 30, 1921.

Geology and water resources of the Goose Creek basin, Cassia County, Idaho, A. M. PIPER (*Idaho Bur. Mines and Geol. Bul. 6 (1923), pp. 78, pls. 5, fig. 1*).—This report, prepared in cooperation with the U. S. Geological Survey, is based on a survey of the geology and ground water resources of an area of 1,200 square miles in Cassia County, Idaho.

Surface water supply of Ohio River basin, 1921 (*U. S. Geol. Survey, Water-Supply Paper 523 (1925), pp. VI+316, pls. 2*).—This report, prepared in cooperation with the States of Pennsylvania, West Virginia, Ohio, Kentucky, Illinois, North Carolina, and Tennessee, presents the results of measurements of flow made on streams in the Ohio River basin during the year ended September 30, 1921.

Surface water supply of the New-Kanawha River basin, West Virginia, Virginia, and North Carolina, A. H. HORTON and G. C. STEVENS (*U. S. Geol. Survey, Water-Supply Paper 536 (1925), pp. IV+282, pls. 2*).—This report, prepared in cooperation with the State of West Virginia, presents the results of measurements of flow on streams in the New-Kanawha River basin.

The farm pond, W. H. MCPHEETERS (*Okla. Agr. Col. Ext. Circ. 175 (1925), pp. 7, figs. 4*).—Practical information on the layout and construction of a dam and spillway for a farm pond is presented, with particular reference to Oklahoma conditions.

Public Roads, [March, 1925] (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 1, pp. 28+[2], figs. 46*).—This number of this periodical contains the status of Federal-aid highway construction as of February 28, 1925, and motor vehicle registration and revenues for the year 1924, together with the following articles: Transverse Distribution of Motor Vehicle Traffic on Paved Highways, by J. T. Pauls; The Effect of Moisture on Concrete, by W. K. Hatt (see p. 84); Curing Concrete with Calcium Chloride, by C. L. McKesson (see p. 84); and Vertical Pressure of Earth Fills Measured, by C. N. Conner.

Removal of capillary moisture in highway subgrades, C. M. UPHAM and H. F. JANDA (*Engin. News-Rec., 93 (1924), No. 23, pp. 912, 913, figs. 3*).—Studies are reported with several soils such as clay, sand-clay, top soil, etc., which showed that draintile are of no direct value in removing or preventing the rise of purely capillary moisture, and that the percentage of capillary moisture is reduced as the elevation of the subgrade above the water table is increased.

It was further found that a layer of coarse noncapillary material is an effective agent in preventing the rise of capillary moisture, some materials being more effective than others. Sand seemed to be the most effective agent in preventing such capillary action.

The effect of moisture on concrete, W. K. HATT (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 1, pp. 14-23, figs. 19*).—Investigations conducted by Purdue University in cooperation with the Bureau of Public Roads are reported, the primary purpose of which was to measure the maximum warping and surface deformation of a concrete road slab, resulting from nonuniform distribution of moisture, as a basis for measuring possible initial stresses.

The results showed that the strength of concrete varies with its moisture content. Apparently the strength of saturated concrete will be from 80 to 85 per cent of that of dry concrete. The thermal coefficient of expansion of concrete was found to vary with the temperature and the moisture conditions. Concrete expanded when immersed in water and contracted on drying, the degree of change of length varying markedly with the characteristics of the cement, the richness of the mix, the size of specimen, and the conditions of exposure.

Concrete road slabs warped upward at the corners and at the edges when the surface became dry, and also when the bottom absorbed the moisture from the subgrade. Drying the top surface of the slab under observation caused the corners to deflect upward 0.12 in., and saturating the bottom of the slab caused an upward deflection of 0.2 in. The tests indicated the presence of an initial stress in the surface of the road slab arising from the warping. A combination of shrinkage from drying and from a fall in temperature was found to produce maximum shrinkage strains.

Curing concrete with calcium chloride, C. L. MCKESSON (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 1, p. 23*).—Tests conducted by the California Highway Commission are briefly reported, indicating that calcium chloride is from 80 to 90 per cent efficient, and that it may be used as a substitute for water curing where water is scarce. Some of the strength appeared to be sacrificed, but the cores showed a minimum average strength of more than 3,000 lbs. in the most unfavorable case, thus indicating a fair factor of safety.

Blasting: What to do and how to do it, J. SWENEHART and W. A. ROWLANDS (*Wis. Agr. Col. Ext. Circ. 164 (1923), pp. 36, figs. 58*).—Practical information on the uses of explosives in agricultural blasting is presented, with particular reference to Wisconsin conditions.

Popular mechanics handbook for farmers (*Chicago: Popular Mechanics Press, 1924, pp. [4]+270, illus.*).—A large amount of practical information on farm mechanics is presented.

Modern farm machinery, D. N. MCHARDY (*London: Methuen & Co., Ltd., 1924, pp. XVIII+235, pls. 3, figs. 147*).—This book deals mainly with mechanical aids to agricultural production and to a certain extent with transporting machinery. It contains chapters on mechanical principles employed in farm machinery; materials and methods used in the construction of farm machinery; the plow; operation of the plow; special-purpose plows; drainage machinery; cultivators, harrows, and rollers; rotary tillage; seeding machinery; artificial manure distributors; root-growing machinery; the grass mower; hay-harvesting machinery; the reaper and binder; stationary motors for farm work; barn machinery; the cream separator; the threshing machine; the silage cutter; elevating and conveying machinery; pumps and spraying machinery; farm transport; electricity on the farm; and the farm workshop.

The missing pressure in gas engines, W. T. DAVID (*Engineering [London], 118 (1924), No. 3070, pp. 623, 624, figs. 3*).—Studies with closed vessels are

heat, in gaseous explosions is due to incomplete combustion, increasing specific heat, and heat loss to the walls of the vessel during the explosion period. The extent to which incomplete combustion contributed to the limiting of the pressures was not very different in the mixtures tested, but the extent to which the other two causes contributed to this varied considerably from mixture to mixture.

From a study of the application of the results of closed-vessel experiments to the gas engine, it seemed improbable that combustion factors greater than about 70 per cent are realized in gas engines with normal ignition. The belief is expressed that in gas engines with normal ignition the maximum pressure occurs generally more or less in the neighborhood of the moment of complete inflammation, which marks the end of the period of the maximum rate of rise of pressure in the closed vessel. After-burning then continues during the expansion stroke.

The defect of the actual efficiency from the ideal efficiency appears to be due mainly to the rapid heat flow into the cylinder walls in the case of strong mixtures and to slow inflammation and after-burning in the case of weak mixtures.

Heat loss in gas engines, W. T. DAVID (*Engineering* [*London*], *118* (*1924*), *No. 3070, pp. 629, 630, figs. 8*).—Studies of the radiation and conduction losses during the explosion and subsequent cooling of inflammable mixtures of coal gas and air in a closed vessel are reported.

The results of importance in gas engine design which were observed were (1) the emphasis on the very marked influence of temperature upon the heat loss from the working fluid both by conduction and radiation, and (2) the indication that the radiation per unit area of wall surface increases greatly with cylinder dimensions.

It was found that the intrinsic radiance at the maximum temperature developed varies very approximately as the square root of the cylinder dimensions. Thus while the conduction loss from the hot gaseous mixture at any given temperature over the entire surface of the vessel varies as the square of the cylinder dimensions, the loss of heat by radiation from the hot mixture at any temperature over the entire surface of the vessel varies as the five-halves power of the cylinder dimensions.

An application of these results to the gas engine is outlined, with special reference to the effect of cylinder dimensions upon heat loss. It is brought out that, similarly to the closed vessel, the heat loss per unit area of wall surface increases with the cylinder dimensions in the case of gas engines working under similar conditions of mixture strength and speed.

Progress in rural service study, I, II, A. M. PERRY (*Elect. World*, *84* (*1924*), *Nos. 24, pp. 1253–1257, figs. 5; 25, pp. 1297–1301, figs. 6*).—These two articles deal with progress in the work undertaken on the application of electricity to agriculture by several State colleges and experiment stations. Special attention is drawn to the Minnesota Station, and some of the details of its work are outlined.

Thawing frozen water pipes with electric current, D. D. EWING and C. F. BOWMAN (*Purdue Univ., Engin. Ext. Serv. Bul. 7* (*1924*), *pp. 16, figs. 10*).—A summary of present practices in the thawing of frozen water pipes with electric current is presented, together with lists of the equipment required for some of the arrangements that have proven successful. Data on the electrical characteristics of certain small sizes of commercial steel pipe are also presented.

Colter and plow point [trans. title], M. RINGELMANN (*Jour. Agr. Prat., n. ser.*, *42* (*1924*), *No. 45, pp. 357–359, figs. 6*).—A brief analysis is given of the

point, on draft. An actual test showed that the draft was 3 per cent greater where the colter was placed in advance of the plow point, indicating apparently that the location of the knife colter has a greater relative influence on the draft than that of the plow point with respect to the colter.

Dairy barns for Nebraska, O. W. SJOGREN and I. D. WOOD (*Nebr. Agr. Col. Ext. Circ. 721 (1924), pp. 32, figs. 31*).—Practical information is given on the planning and construction of dairy barns for Nebraska, together with numerous working drawings.

Housing farm poultry, R. T. PARKHURST, P. MOORE, and M. R. LEWIS (*Idaho Agr. Col. Ext. Bul. 42, rev. (1923), pp. 40, figs. 30*).—This bulletin contains practical information on the planning and construction of poultry houses adapted to Idaho conditions, together with working drawings and bills of material.

Poultry houses and poultry equipment for Texas, E. O. EDSON and M. R. BENTLEY (*Tex. Agr. Col. Ext. [Bul.] 65 [1923], pp. 32, figs. 50*).—Practical information on the planning and construction of poultry houses adapted for conditions in Texas is given, together with numerous working drawings.

The iodine content of Michigan water supplies, E. F. ELDRIDGE (*Amer. Jour. Pub. Health, 14 (1924), No. 9, pp. 750–754, figs. 2*).—Studies of the iodine content of the water supplies of Michigan conducted in connection with a survey of the goiter situation in that State are briefly reported.

Contrary to expectations, a number of places were found in the State where the ground water supplies contained some iodine. These places include a strip of counties running northwest and southeast between and including Midland, Macomb, and Saginaw. In general these counties are the high iodine counties of the State, and at no other place was iodine found in amounts above three parts per billion. No iodine was found in any of the ground water supplies of the northern peninsula nor the upper part of the lower peninsula, and none of the surface water supplies examined showed a trace of iodine except those of the Great Lakes. A few of the mineral waters and brines showed a great variation, depending upon location and depth.

It is noted that, although iodine increased with chlorine, there was no definite ratio between the two, and the amounts present seemed to depend upon the location and depth from which the sample was taken. Bromides were also present where iodine was found.

The protection of wells used as a source of domestic water supply (*Ontario Bd. Health Ann. Rpt., 42 (1923), pp. 147–150*).—The results of sanitary surveys of a large number of private wells are tabulated, indicating that the number of dug wells of fair quality is very small, especially where no pumps or only wooden tops are provided. Dug wells with concrete tops showed an improvement, although it is evident that concrete tops were not always supplemented by water-tight walls and gutters. Drilled and driven wells showed a decided improvement, although it is noted that the percentage of fair quality wells might be increased by better attention to the casings and tops.

Aeration studies on creamery waste purification, M. LEVINE, L. SOPPELAND, and G. W. BURKE (*Iowa Engin. Expt. Sta. Bul. 68 (1923), pp. 39*).—Studies on the principles involved in the purification of dairy wastes are reported.

The results showed that a creamery waste differs markedly from ordinary sewage in many respects, but particularly in that it contains the carbohydrate lactose which rapidly undergoes acid fermentation, thereby rendering the waste extremely refractory to septic tank treatment. It was found that the acid-producing constituents can be eliminated by direct oxidation. Four hours' aeration of 2 or even 3 per cent skim milk with activated sludge was sufficient to yield effluents which would not become appreciably acid on storage under

for admixture with sewage in septic tanks. An activated sludge was developed in about two weeks from 2 per cent skim milk.

Aeration of 2 per cent skim milk for from 16 to 23 hours in bottles or in barrels, with 20 per cent activated sludge and from 50 to 60 cu. ft. of air per gallon, effected marked reductions in turbidity, acidity, total solids, organic nitrogen, and particularly in oxygen consumed and oxygen demand. Reductions of from 95 to 98 per cent in the oxygen requirements were generally obtained.

Activated sludge treatment was more effective with 2 per cent buttermilk than with skim milk.

With separately, partially aerated sludge, employing an aeration period of 6 hours and 15.6 cu. ft. of air per gallon, there was an average reduction of 43.9 per cent solids, 77.7 per cent organic nitrogen, and 76 per cent oxygen consumed and oxygen demand. Reducing the air supply to 11.4 cu. ft. per gallon and increasing the aeration period to 12 hours resulted in about 20 per cent greater reductions.

Elimination of 95 per cent of the oxygen-requiring constituents from 2 per cent skim milk or buttermilk was not sufficient to yield stable effluents. It is thought that possibly better distribution of air, together with mechanical agitation, may give more stable effluents.

These results are taken to indicate that the employment of activated sludge with a view to yielding stable effluents may not be economically practical for a small plant. However, it is concluded that the possibilities of utilizing activated sludge and particularly trickling filters as preliminary processes for treatment of creamery wastes warrant investigation.

Can sewage sludge be decomposed aerobically? [trans. title] BACH (*Gsndhts. Ingen., 47 (1924), No. 37, pp. 407, 408*).—Studies are briefly reported which showed that the mineralization of sewage sludge under aerobic conditions is not much more rapid than under anaerobic conditions. Sludge ventilated for 29 days was not drained any more easily than unventilated sludge. It is concluded that such ventilation not only is of no particular advantage, but that the resulting condition of the sludge is less favorable to complete sedimentation owing to the formation of a gelatinous slime which is held in suspension by the water.

RURAL ECONOMICS AND SOCIOLOGY

Published and unpublished research in agricultural economics in the Middle Western States (*Chicago: Midwest Agr. Econ. Research Council, 1924, pp. [5]+74*).—This tentative bibliography gives the titles and a brief description of the principal published and unpublished research studies in agricultural economics that are being carried on in the Middle Western States or are of interest to workers in that section. The Midwest Agricultural Economics Research Council is a voluntary coordinating council composed of research agencies of the Middle West and the U. S. Department of Agriculture. Its purpose is to stimulate and coordinate studies in agricultural economics. This and the one noted below are mimeographed publications prepared by this council and the Bureau of Agricultural Economics, U. S. D. A., cooperating.

Current research in agricultural economics in the Middle Western States (*Chicago: Midwest Agr. Econ. Research Council, 1924, pp. [2]+37*).—This is a preliminary review furnishing the titles and a brief description of the current research studies in agricultural economics.

Dry farming in western Kansas, E. O. WOOTON (*U. S. Dept. Agr., Bur. Agr. Econ., 1925, pp. 51, figs. 3*).—This is a preliminary report in multigraphed form. Representatives of the Bureau of Agricultural Economics and the Kansas Experiment Station interviewed 135 owner and part-owner farmers in Sherman, Thomas, and Finney Counties in Kansas, and a preliminary report is made here summarizing their farm businesses for the year ended March 1, 1923, giving as well some information with regard to the history of the agricultural development of the region. It was found that the farm year of 1922 was not a very profitable one for most of the farmers. Generally considered, however, the farming business in the area was solvent. From 27 to 33 per cent of the farms had no mortgage indebtedness, while from 30 to 40 per cent more of them had only a small indebtedness. Over five-sixths of the farmers in Sherman County, more than three-fourths of those in Thomas County, and about two-thirds of those in the Finney County area have made gains in net worth since settling in this region, without taking into consideration the natural increase in value of their lands. This increase is considerable for those who settled there several years ago when land was cheap.

Cattle feeding in relation to farm management, H. C. M. CASE and K. H. MYERS (*Illinois Sta. Bul. 261 (1925), pp. 213–243, figs. 7*).—A combined financial statement and a statement of averages are given for the cost of feeding 1,558 steers in 38 lots finished for market in the period 1913–1922 in Hancock County, Ill. It appears that the average cost of adding 273.7 lbs. of gain was $52.83. Marketing charges were $2.87 per steer, and the finished animal weighing 1,167.9 lbs. represented a total cost of $124. The net selling price was $113.90, the net profit allowing a credit of $12.17 for by-products amounting to $2.07 per steer. The results on the different farms varied, however, from a profit of $12.60 per steer to a loss of $14.50 in the same year.

During the 10 years covered by the study, feed made up 85.5 per cent of the feed lot costs, man labor 4.1 per cent, and interest 4 per cent. General farm expense made up 2.9 per cent, horse labor 1.81, buildings 0.82, miscellaneous 0.21, and death risk 0.66 per cent.

Certain variations are discussed, as is also the relationship between cattle feeding costs and other farm costs. An analysis of one of the farms in the study, which is given in detail here, is noted below.

The place of the beef cattle feeding enterprise in the organization of Corn Belt farms, H. C. M. CASE (*Jour. Farm Econ., 6 (1924), No. 2, pp. 179–191*).—The data used in this paper were secured in detailed cost accounting investigations conducted in Hancock County, Ill., during the 10-year period 1913–1922, as noted above. In order to demonstrate the relation of the cattle feeding enterprise to the farm business, the case of an individual farm of 295 acres on which 40 to 79 cattle were fed annually, or 395 cattle during the 7-year period for which records were obtained, is cited. The utilization of crops in cattle feeding, as well as of man and horse labor, general and other expenses, and the advantage in the way of soil maintenance or improvement are shown. A financial statement is given of the entire farm business, and the assertion is made that the cattle feeding enterprise added $508.61 to the family income. The additional credit of $313.78 for the value of plant food returned to the soil as a result of cattle feeding gives a total credit to the cattle feeding enterprise of $822.39 from the standpoint of the farm as a whole, whereas the cost figures of the enterprise analyzed separately from the farm business gave the enterprise a profit of only $290.63.

A history of the public land policies, B. H. HIBBARD (New York: Mac-

development and operations of Federal land policies in the United States. The chapters are land as a source of revenue; the acquisition of the public domain; the disposition of the public domain before the adoption of the Constitution; early plans for land disposal under the Constitution, 1787–1804; the credit system; the cash sales system after 1820; military bounty lands; the public domain as a basis of national development, 1841 to 1900; preemption rights; the distribution of the proceeds from the sale of lands and the cession of lands to the States; claim associations; speculation; Federal land grants for internal improvements; swamp land grants; graduation of the price of land; land grants for educational purposes; the homestead or free land for settlers; the modifications and operation of the Homestead Act; the timber culture act; the desert land acts; disposal of timber and timber lands; the period of conservation, 1900–1920; grazing the public domain; classification of the public lands; mineral lands; reserved lands; effects of the land policies on agriculture; and the public land policies reviewed and criticized.

Farm profits, C. T. DOWELL (*Oklahoma Sta. Circ. 56 [1925], pp. 13*).—Certain topics deemed particularly urgent at present are discussed here, including our beef cattle industry, the use of good seed, conservation of water in the soil, per acre yields and profits, marketing farm products, and feeding the family.

Double entry accounts for farmers, J. A. HOPKINS (*Iowa Sta. Circ. 96 (1924), pp. 24, figs. 5*).—This circular is designed to explain the general principles which underlie all systems of double entry accounting. It describes the necessary accounts and gives directions for making inventories, keeping the ledger, and the book of original entry, as well as for closing and analyzing the ledger.

Cost of growing apple trees under tillage and grass-mulch management, C. W. ELLENWOOD (*Ohio Sta. Mo. Bul., 10 (1925), No. 1–2, pp. 7–13, figs. 3*).—An orchard of 48 trees was set out on the station farm in 1915. Aside from the original cost of the trees and planting, the items of expense on two plats have been kept under four accounts. For the cover crop plat these were cultural cost, cover crop seed, pruning, and spraying, and for the grass mulch plat the item of mulch material is substituted for cover crop seed. No charge was made for land rental, interest on investment, or supervision of the orchard.

The total cost per tree for the 10-year period in the cover crop plat was $5.69 and in the grass mulch plat $3.35, or counting only the trees living at the end of the period $5.89 and $3.75, respectively. The average income per tree for the 10-year period on the cover crop plat was $6.51 and on the grass mulch plat $6.91.

Report on an enquiry into agricultural wages in the Bombay Presidency, G. F. SHIRRAS (*Bombay: Govt. Labor Office, 1924, pp. III+152, pls. 8*).—The object of this inquiry was to ascertain the annual changes in agricultural wages from 1900 to 1922, inclusive, in all districts of the Bombay Presidency including Sind. Statistics of the rates paid in or near the headquarters town in each district as representing wages in urban areas and for one other town in each district as representing wages in rural areas were collected. The main groups of wage earners were classified as field, ordinary, and skilled labor.

The number of persons engaged in agriculture in the Presidency, excluding native States, fell by 14 per cent between 1911 and 1921 and that of agricultural laborers by 37 per cent in the same period. The number of ordinary laborers increased by 24 per cent as a result of local industrial development. The number of skilled laborers fell by 2 per cent. Various officials who were questioned expressed the opinion that the purchasing power of the agricultural

pared with 1900 for all classes of labor. In rural areas real wages had risen for skilled labor, but had slightly fallen in the case of ordinary and field labor. The hours of working had decreased on the whole as compared with 10 years ago. The number of holdings in the area under study increased by 3 per cent as compared with 5 years ago, and the average size of holding decreased from 15.8 to 15.4 acres in the last 5 years. The following table summarizes the changes in wages discovered:

Percentage increases in daily average wages in the Bombay Presidency

Kind of labor	Urban areas			Rural areas		
	1913 over 1900	1922 over 1913	1922 over 1900	1913 over 1900	1922 over 1913	1922 over 1900
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Field laborers	58	89	200	70	71	190
Ordinary laborers	47	92	182	75	62	183
Skilled laborers	28	95	149	31	79	133

A manual of the theory and practice of legislation with respect to accidents in agriculture and mutual benefit societies, J. BOUCHET (*Manuel Théorique et Pratique de la Législation sur les Accidents Agricoles et les Sociétés d'Assurances Mutuelles Agricoles. Paris: Marcel Rivière, 1923, pp. III+268+24*).—This handbook is designed to answer questions which may be raised in carrying out the provisions of the law of December 15, 1922, providing protection and insurance against accidents in farm work in France. Mutual benefit societies of various types are outlined in some detail.

Accidents in agricultural labor, A. PLAISANT (*Les Accidents du Travail Agricole. Paris: J. B. Baillière & Sons, 1924, pp. 93*).—This is a handbook for farm operators in France, showing their responsibility under the law noted above. It relates particularly to insurance against accidents in agriculture, and earlier ones not relating specifically to agriculture but to labor in general. The appendix contains the text of the laws pertaining to accidents.

The weakest point in the farmer's financial policy, B. M. ANDERSON, JR. (*Chase Econ. Bul., 4 (1924), No. 5, pp. 32*).—The author urges a consistent policy for farmers of capitalizing their unusual profits and building up liquid reserves in good years as a protection against unfavorable markets as well as against bad seasons. It is pointed out that in the absence of corporate organization agriculture can not make use of the sale of shares as an automatic protection against the accumulation of debt through changes of ownership by sale or inheritance. The increase of land values also is often automatically accompanied by an increased agricultural debt.

The country banker is urged to keep local customers advised as to safe investments in liquid securities.

Federal Farm Loan Act, amendments, rules, and regulations, compiled by E. A. LEWIS (*Washington: Govt., 1924, pp. [2]+79*).—The text is given of the Federal Farm Loan Act and amendments; the act of March 4, 1923, providing intermediate credit for agriculture; and rules and regulations pertaining to Federal intermediate banks.

Taxation of rented farms, 1919, C. O. BRANNEN and J. T. SANDERS (*U. S. Dept. Agr., Bur. Agr. Econ., 1925, pp. 34*).—In this preliminary study, issued in multigraphed form, it was intended to determine the relation of State and local

areas. Data were assembled also in a few of the counties to show the relation of taxes to rent of urban real estate, and analyses were made to indicate the proportions of the tax levied by the State, county, and local governmental agencies and to show the major purposes for which such taxes were levied. A total of 3,221 farms in 31 counties in 26 States were included.

A large percentage of farm rents in many counties was paid out in taxes in 1919, when rents were higher and taxes lower than they are at present. It is believed, in fact, that since 1919 taxes have absorbed all the income from rent on many of the less favored farms. Excessive farm real estate taxation results from the attempt to apply sale value as a uniform measure of the tax to classes of property yielding differing rates of return and varying in the difficulty with which they are reached under general property tax methods. The solution of this part of the problem may finally be found in the assessment of certain rather than uncertain values and in the measurement of the tax more nearly than it is now according to earning capacity. The situation would further be remedied by raising more revenues from sources that are now yielding a smaller tax return than they might for distribution in such a way as to relieve the present excessive local tax burden. Six tables constitute an appendix.

Bibliography on the marketing of agricultural products, compiled by E. L. Day, K. Jacobs, and M. T. Olcott (*U. S. Dept. Agr., Misc. Circ. 35 (1925), pp. IV+56*).—This bibliography has been prepared under the direction of M. G. Lacy. It is designed to include the more important references to publications in English on methods of marketing agricultural products and discussions of the principles upon which methods should be based. It is arranged in 13 parts, which are devoted, respectively, to general marketing, markets, cotton, grain, seeds, hay, livestock and meats, wool, hides and skins, dairy products, poultry and eggs, fruits and vegetables, and miscellaneous crops.

The co-operative marketing of farm produce, C. A. Dunning (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 6, pp. 530–542*).—An address delivered on July 29, 1924, before the Conference on Agricultural Cooperation in the empire, held at the British Empire Exhibition, is abridged here. The discussion is confined to cooperation in Canada and particularly in the Province of Saskatchewan, and covers cooperative grain selling and the cooperative marketing of dairy produce and livestock. The advantages and disadvantages of State financial aid are pointed out.

Marketing Michigan potatoes, J. T. Horner (*Michigan Sta. Spec. Bul. 137 (1925), pp. 32, figs. 13*).—Some statistics are given showing the production of potatoes in Michigan and are followed by a discussion of improving the quality, methods of handling, types of local dealers and potato markets in Michigan, factors influencing the price, and increasing the profits.

Carload shipments of fruits and melons from stations in the United States for the calendar years 1920, 1921, 1922, and 1923 (*U. S. Dept. Agr., Statis. Bul. 8 (1925), pp. 79*).—This bulletin shows for each of 17 kinds of fruits and melons the number of cars billed during the years noted from every station handling 10 or more cars in any one year, grouped by States and counties. The information has been compiled from monthly mail reports furnished to the Bureau of Agricultural Economics by about 15,000 station agencies of railroad, express, and boat lines.

Carload shipments of vegetables from stations in the United States for the calendar years 1920, 1921, 1922, and 1923 (*U. S. Dept. Agr., Statis. Bul. 9 (1925), pp. 99*).—Tabulations of statistics similar to the above are shown for each of 18 kinds of vegetables.

Statistics of potatoes and sweet potatoes (*U. S. Dept. Agr., Statis. Bul 10* (1925) *pp. 51*).—The statistics presented here include data on acreage, production, stocks, and marketing of potatoes and sweet potatoes for the year ended July 31, 1924, with comparable data for earlier years.

Crops and Markets, [April, 1925] (*U. S. Dept. Agr., Crops and Markets, 3* (1925), *Nos. 14, pp. 209–224; 15, pp. 225–240; 16 pp. 241–256; 17 pp. 257–272*).—Abstracts are given of the week's market reports, together with tabulated summaries of the receipts and prices of important classes of agricultural products and specific commodities on the domestic market as of current date, with comparisons. Notes on the foreign crops and market situation are included.

Monthly Supplement to Crops and Markets, [April, 1925] (*U. S. Dept. Agr., Crops and Markets, 2* (1925) *Sup. 4, pp. 105–144, figs. 5*).—Special investigations are reported upon showing the indicated percentages of horses and mules of different ages on farms in April, 1925, by States; the value of farm products in terms of nonagricultural commodities; the average percentage of total annual marketings of important crops made each month for the 10-year period beginning July 1, 1914; the distribution of estimated value of farm products among the States, 1909–1924; prices of purebred cattle, 1923–1924; and factors affecting hog prices. Other items included are the crop report for April and a review of wages of hired farm labor. The usual estimated farm prices of important products and statistical reports of livestock and meat and milk marketing, cold storage, shipments of fruits and vegetables, and receipts of grain, as well as reviews of world agriculture and the current price situation, are given.

Crop report regulations (*U. S. Dept. Agr., Misc. Circ. 37* (1925), *pp. 4*).—The regulations governing the publication of reports and the information utilized in the compilation of reports, prepared by the Bureau of Agricultural Economics, concerning acreages, conditions, yields, farm reserves, or quality of products of the soil grown within the United States are reproduced.

The agricultural outlook for 1925 (*U. S. Dept. Agr., Misc. Circ. 38* (1925), *pp. 24*).—This report, prepared by the staff of the Bureau of Agricultural Economics, was intended to provide a basis upon which farmers may make plans for the 1925 season and to aid leaders in formulating cooperative, production, and marketing programs. The situation as regards the major crops and kinds of livestock is summarized, and the general outlook with reference to domestic and foreign demand, agricultural credit, and farm labor and equipment is analyzed.

Four types of index numbers of farm prices, L. H. Bean and O. C. Stine (*Jour. Amer. Statis. Assoc., 19* (1924), *No. 145, pp. 30–35*).—The four types of index numbers considered here are described as an index of prices weighted by fixed annual quantities sold, an index of prices with seasonal variations eliminated weighted by fixed annual quantities sold, an index of prices weighted by monthly sales, and an index of prices with seasonal variations eliminated weighted by monthly sales. Taking as a base the 5-year period from August, 1909, to July, 1914, inclusive, the most nearly normal period for which monthly farm price data are available, the seasonal variation in prices is said to be eliminated from index numbers by dividing the price (or aggregate) of any given month by the average price (or aggregate) of the five corresponding months of the base period. The average sales for each month of a normal year or period may be used as quantity weights in order to allow for seasonal variation in the quantities marketed. Sales in the period 1918–1922 are used in computations here, and the authors let P_i equal

for the corresponding month, *Qa* the quantity per annum; and *Qc. m.* the quantity for the corresponding month. They express the four possible types of aggregative index numbers in formulas as follows:

$$\text{Type A} = \frac{\text{Sum } (Pi \quad Qa)}{\text{Sum } (Po \quad Qa)}$$

$$\text{Type B} = \frac{\text{Sum } (Pi \quad Qa)}{\text{Sum } (Pc.\, m. \quad Qa)}$$

$$\text{Type C} = \frac{\text{Sum } (Pi \quad Qc.\, m.)}{\text{Sum } (Po \quad Qc.\, m.)}$$

$$\text{Type D} = \frac{\text{Sum } (Pi \quad Qc.\, m.)}{\text{Sum } (Pc.\, m. \quad Qc.\, m.)}$$

The principal differences in the index numbers constructed by each of these methods are pointed out. It is held that in choosing the index number best suited for measuring changes in farm prices it must be considered whether the purpose is to show changes in value of a constant load of commodities, changes in value of a constant load adjusted for seasonal price trend, changes in the level of farm prices of commodities as they are normally marketed, or variations from the normal prices of commodities as they are normally marketed.

Tudor economic documents, edited by R. H. TAWNEY and E. POWER (*London and New York: Longmans, Green & Co., 1924, vol. 1, pp. XIII+383*).—This is volume 1 of a collection of documents relevant to the economic history of the Tudor period in England, which is planned to include two later volumes. In it are given two sections directly related to agriculture, those under the captions of agriculture and rural society and the corn trade and the food supply. The text is carefully reproduced of selected documents, arranged usually in chronological order.

Agricultural tribunal of investigation.—Final report, W. J. ASHLEY ET AL. (*London: Govt., 1924, pp. 405, pls. 3, figs. 5; abs. in Econ. Jour., 34 (1924), No. 135, pp. 398–407*).—This final report concludes a series, other parts of which have been noted (E. S. R., 51, p. 90). While the earlier ones recommended measures for the immediate assistance of agriculture, this report is more largely devoted to the consideration of matters of long-time importance and general observations on the place of agriculture in the national life of Great Britain in comparison with its position in other countries. It is composed of the report by W. J. Ashley et al., that of D. H. Macgregor, six memoranda by W. J. Ashley, and two by C. S. Orwin. The sixteen appendixes comprise memoranda and statistical summaries from official and other sources.

W. J. Ashley, W. G. S. Adams, and C. S. Orwin in their majority report hold that increased production of wheat and the attendant employment of more laborers is not only desirable but essential. They hold that, short of some sort of protection, nothing but the extension of arable dairying and stock farming can maintain the tillage area of the country. Attention is given also to systems of land tenure, the incidence of tariffs, the growth of the cooperative movement, and the endowment of research and education abroad; and increased expenditure, particularly for research and organization for the benefit of British agriculture, is recommended. In the minority report D. H. Macgregor holds that British agriculture compares favorably with that of other countries, and that only on grounds of national defense would the artificial increase of output seem advisable. He favors the continued creation

formation of district wages boards, and supports the recommendations of his associates with reference to organization, finance, transport, and other long-time methods of assistance noted.

A socialist policy for agriculture (*London: [Independent Labor Party] Inform. Com., 1924, pp. 32*).—The Independent Labour Party presents a scheme for an agricultural policy for England which would provide for the creation of an agricultural bank to finance societies for purchase and sale and to foster rural industries. Also it is suggested that the importation of wheat, meat, and milk products be centralized and nationalized under a board of supply. It is proposed that the management of agricultural land, together with the promotion of better husbandry and cooperation, be placed in the hands of county agricultural committees; that land courts, a wages board, and county wages committees be set up; and that the State undertake the building of about 200,000 laborers' cottages in the rural districts of England and Wales and 75,000 in Scotland.

Cooperating under the Iowa cooperative laws, F. ROBOTKA (*Iowa Sta. Circ. 95 (1924), pp. 3–16*).—The author discusses the available legal forms of organization in Iowa in the light of their adaptability to the different purposes of farmers' organizations.

The work of cooperative societies of reconstruction in the devastated regions, P. CABAUD (*L'Oeuvre des Sociétés Coopératives de Reconstruction dans les Régions Dévastées. Coulommiers: Paul Brodard, 1924, pp. VII+185*).—A study of their origins, the legislation providing for them, and the economic and social rôle played by cooperative societies, unions, and federations, and general confederations of cooperatives in restoring agricultural and other enterprises in the devastated areas of France is presented in part 1 of this volume. Part 2 deals with the financial resources of these societies and the loans extended by them.

The cooperative movement in Czechoslovakia, L. F. DVOŘÁK (*Prague: "Centrokooperativ," 1924, pp. 76*).—The character of agricultural cooperation, its development, and the present position of agricultural societies are phases of this topic which receive the major share of the consideration here.

Tourist camps, C. P. HALLIGAN (*Michigan Sta. Spec. Bul. 139 (1925), pp. 3–19, figs. 16*).—The author suggests the important considerations in selecting a camp site and describes camp accessories, signs, and the landscape plan.

Agricultural statistics [for Scotland], 1923, J. M. RAMSAY (*Scot. Agr. Statis., 12 (1924), Nos. 1, pp. 48; 2, pp. 49–71; 3, pp. 73–98*).—These annual official statistical reports of agriculture for Scotland continue the series previously noted (E. S. R., 51, p. 94).

An agricultural census for 1923 [trans. title], G. JAHN (*[Norway] Statis. Centralbyrå, Represent. Landbrukstelling, 1923, pp. [4]+41*).—Returns are submitted from an agricultural census in Norway for 1923, and data for earlier years are included.

AGRICULTURAL EDUCATION

Adult education in Scandinavia and America (*New York: W. H. Wilson, Conf. South. Mountain Workers, [1924], pp. 46*).—The People's College in Denmark and What It May Mean to the Highlands, by Mrs. J. C. Campbell, and An Adaptation of the Danish Theory to a Country with Super-rural Problems—Finland, by M. Butler, two addresses delivered at the Conference of Southern Mountain Workers, Knoxville, Tenn., in April, 1924, are published here.

Handbook of commercial geography, G. G. CHISHOLM (*London and New York: Longmans, Green & Co., 1925, new ed., rev., pp. XV+825, pls. 13, figs. 29*).—This is an exhaustive compilation treating the subject under the heads of commodities and regional geography.

General agriculture, D. F. DICKERSON and F. C. EGGERS (*Atlantic, Iowa: Hawkeye Ptg. Co., 1925, pp.* [76]).—This teaching outline is intended primarily for use in a one-semester course in agriculture in high school or normal school, to be supplemented by laboratory work and field trips. Specific reference reading is cited for each of the 38 chapters.

Some tested methods for livestock improvement, D. S. BURCH (*U. S. Dept. Agr., Misc. Circ. 33 (1925), pp. II+20, figs. 7*).—Methods that apply to all livestock and to special classes are described in this circular for the use of persons who are seeking similar results. A list of selected material on livestock improvement is given.

Practical farm economics, H. C. TAYLOR, H. R. TOLLEY, and J. W. TAPP (*U. S. Dept. Agr., Misc. Circ. 32 (1924), pp. IV+100, figs. 19*).—Elementary principles of what and how to produce and sell are set forth in 14 chapters, covering farm crops and livestock, the size of the farm business, the use of credit, marketing, better living on the farm, and other economic phases of farming.

Simple farm accounts, R. E. WILLARD (*Fargo, N. Dak.: Author, 1924, 2. ed., pp. 107*).—A second edition of a textbook and guide previously noted (E. S. R., 47, p. 294).

Helps for the rural school nurse, H. and H. WEDGWOOD (*U. S. Bur. Ed., Health Ed. No. 17 (1924), pp. VI+54, figs. 20*).—The authors endeavor to offer a few concrete simple suggestions, particularly calling attention to publications, study courses, journals, and sources of illustrative and other materials.

Contribution of home economics to citizenship training, edited by E. S. WHITCOMB (*U. S. Bur. Ed. Bul. 3 (1925), pp. III+43*).—A conference of city supervisors of home economics held in Washington, April 21, 1924, is reported. A paper on how the Federal departments are meeting the demands of the school and the home was read by A. C. True. Discussion of the challenge of the health education movement to home economics was contributed by M. E. Brydon and others, of the contribution of home economics to citizenship by H. T. Woolley and others, of the junior high school and home economics by W. S. Deffenbaugh and others, and of home economics in the senior high school by G. Gorton. Brief contributions are also given on what the school expects of home economics, by Mrs. A. H. Reeve, what the home expects of home economics, by M. W. Barry, and how the college is meeting the demands of the school and the home, by C. M. Winchell.

The effectiveness of extension in reaching rural people, M. C. WILSON and D. J. CROSBY (*N. Y. Agr. Col. (Cornell) Ext. Bul. 104 (1925), pp. 31, figs. 12*).—By means of questionnaires distributed to 1,225 farms in two selected townships each in Chenango, Monroe, and Jefferson Counties, N. Y., in 1923 and 1924, the information summarized here was obtained:

On 82 per cent of these farms one or more practices were reported changed because of extension efforts. A total of 3,632 different practices were adopted, of which 2,700 related to agriculture and 932 to home economics. On 44.8 per cent of the farms, propaganda methods were reported as influencing the adoption of improved practices, as compared with 13.1 per cent influenced by personal-service methods and 27 per cent by object-lesson methods. Indirect influences in relation to changed practices were reported on 71 per cent of the farms.

MISCELLANEOUS

Forty-seventh Report of the Connecticut Agricultural Experiment Station for the year 1923, E. H. JENKINS ET AL. (*Connecticut State Sta. Rpt. 1923, pp. VIII+534+XLVIII, pls. 26, figs. 86*).—This report contains the organization list, a report of the board of control, a financial statement for the fiscal year ended June 30, 1923, and reprints of Bulletins 250–260, all of which have been previously noted, and of Bulletins of Immediate Information 28–47, Bulletin 4 of the Tobacco Substation, the second report of that substation, a report of its expenses, and a list of the available station reports and bulletins.

Agricultural experiment station work (tentative plans), H. G. KNIGHT (*West Virginia Sta. Bul. 193 (1924), pp. 32*).—A brief review of the agriculture of West Virginia is followed by an outline of tentative plans for the development of experimental work at the station as approved by the committees from several State agricultural organizations.

Monthly Bulletin of the Ohio Agricultural Experiment Station, [January–February, 1925] (*Ohio Sta. Mo. Bul., 10 (1925), No. 1–2, pp. 32, figs. 6*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Ohio Certified Seed Potatoes, by J. Bushnell; Sprays Control San Jose Scale, by J. S. Houser; and Cattle Feeding Tests, by G. Bohstedt.

NOTES

California University and Station.—Dr. W. L. Howard has been appointed director of the branch of the College of Agriculture at Davis, effective July 1, in addition to his previous duties as head of the division of pomology in the college and station.

Illinois University.—Dr. Edmund J. James, president emeritus since 1920, died June 19, aged 70 years. As president for the 16-year period beginning with 1904, he was widely known as an administrator and executive and was intimately associated with the remarkable development of the university.

Purdue University and Station.—An addition costing $50,000 is being built to the station annex, which will provide additional office and laboratory space. It is also hoped to begin construction in the near future on the first unit of the new horticultural building, for which unit the recent legislature appropriated $150,000.

The annual field day on the Moses Fell Annex Farm June 11 was attended by more than 2,000 people. The soils and crops fertility plats, orchard management experiments, peach variety tests, and pasture experiments were studied. A special program was offered for the more than 400 women who were present. Field meetings were also held at the Worthington and Jennings County experiment fields.

The board of trustees has authorized the establishment of a school for graduate study, and beginning with the September term work leading to the doctor's degree will be offered.

Investigations at the station to extend from three to five years in an attempt to determine definitely the effect of various fertilizing elements, both singly and in combination, upon yield and quality in tomatoes have been provided for through a fellowship established by a fertilizer company, and to which A. H. Watson has been appointed.

The Indiana Canners Association, through its seed committee, has recently provided for the establishment of a research fellowship in the horticultural department. This work will start about July 1 and is expected to continue indefinitely. Dr. J. H. MacGillivray has been appointed in charge.

The degree of doctor of science was conferred on Director G. I. Christie by the Iowa College June 15, in recognition of his services in the development of agricultural education.

Kentucky University and Station.—On May 2, R. E. Tolle resigned as inspector, feeds and fertilizers, and Rama V. Bennett as instructor in home economics. Miss Lula Hale was appointed field worker in the Robinson Substation May 1, and Robert Mathews inspector, feeds and fertilizers, May 25.

Michigan College and Station.—The governing board of the college has recently accepted the management of the Menominee County Agricultural School, located at Menominee in the Upper Peninsula. It is the plan of the board to continue the present course of study, which is of a secondary type, and to add such other courses in agriculture and home economics as will extend the service of the institution to that portion of the State. For the next two years $75,000 has been appropriated by the State to operate the school.

Karl Knaus, formerly county agent leader in Kansas, has been appointed superintendent.

The New Union Memorial Building, financed through contributions by the alumni and friends of the institution, had its informal opening on June 20, alumni reunion day. This building, which will cost about $500,000 when completely finished, will serve a long felt need as a student center at the college.

Chrysanthemum yellows, a new disease in the greenhouse, has been observed in the college greenhouse during the past season. Roguing out of diseased plants and insect control are the recommended methods for combating the disease.

Rutgers University and New Jersey Stations.—At the one hundred and fifty-ninth commencement of the university, 17 students from the College of Agriculture received the degree of bachelor of science, 5 that of master of science, and 5 that of doctor of philosophy.

The appointment to the presidency of Dr. John Martin Thomas, president of the Pennsylvania College since 1921, has been announced to take effect about September 1.

The administration building is being repaired and remodeled, and a new system of roads is being laid out on the agricultural campus. Special appropriations for these purposes were made by the last legislature.

Through the courtesy of the International Education Board, an exchange arrangement has been made with the Rothamsted Experimental Station in the study of soil protozoa. Dr. Charles E. Skinner will sail for England this summer to carry on special studies at Rothamsted during the next year, and H. Sandon of the Rothamsted Station is expected to arrive at the stations in the fall for a similar period of study.

New projects in nutrition and in agricultural economics are being undertaken under the provisions of the Purnell Act. Walter C. Russell, Ph. D., has been appointed biochemist in nutrition to begin work August 1, and G. T. Nightingale, Ph. D., biochemist in horticulture beginning September 1.

Other appointments include Houhanness Heukelekian, Ph. D., Carl D. Jones, and Joseph M. Ginsburg, Ph. D., as biochemists in sewage, cranberry and blueberry, and entomology investigations, respectively; Allen G. Waller as research specialist in agricultural economics; Florence G. Tenny and Luther D. Davis as research assistants in soil microbiology and plant physiology, respectively; Joseph Seiler and John Carncross as research assistants in agricultural economics; Miss Daggmar Peterson as assistant in sewage investigations; Edwin A. Gauntt and Leslie M. Black as assistant extension specialists in dairying and poultry husbandry, respectively; and P. A. Morse and E. J. Frizzell as graduate assistants in dairy products and dairy husbandry, respectively. Forest H. Clickuer and Bonnie R. Fudge have been transferred to the positions of research fellow in poultry nutrition and research assistant in plant physiology, respectively. T. C. Rogers and Nico Mogendorff, research assistants in pomology, and J. B. Lackey, research zoologist, have resigned.

New Mexico Station.—A. L. Walker, head of the poultry department, has been transferred to become chief of the new department of agricultural economics; L. H. Hauter has been appointed part-time assistant in the same department; and L. N. Berry has been appointed head of the poultry department.

North Dakota College and Station.—Dr. Edwin F. Ladd, professor of chemistry and chemist from 1890 until his election to the United States Senate in 1920, and president of the college from 1916 to 1920, died June 22 at Baltimore, Md., at the age of 65 years.

Senator Ladd was born at Starks, Me., December 13, 1859. He was graduated in 1884 from the University of Maine and in 1915 received the LL. D. degree from the same institution. Upon graduation he was appointed assistant chemist in the New York State Station and three years later chemist of that station.

Coming to North Dakota under the pioneer conditions then existing, he built up a department of chemistry which soon attracted wide attention. He became greatly interested in food and drug legislation and its enforcement, and as State chemist and food commissioner labored zealously and effectively in the administration of the North Dakota law. A little later he took a leading part in the enactment and enforcement of a pure paint law, and more recently was a vigorous advocate of the grading of wheat on the basis of the actual milling value.

As a member of the Senate Committee on Agriculture and Forestry, Doctor Ladd took an active interest in agricultural questions, among others the disposition of Muscle Shoals. He reported out the Purnell bill from the committee and led the brief debate on its passage.

Doctor Ladd was a fellow of the American Association for the Advancement of Science. He was prominent in the Association of Official Agricultural Chemists, being elected to life membership in 1921, and the Association of State and National Food and Dairy Departments. In addition to his college duties, he served as Federal food administrator of North Dakota in 1917–1919, and as a member of the Federal commission to fix the price of wheat in 1917. For many years he was the editor of the *North Dakota Farmer*. He was the author of the Manual of Quantitative Chemical Analysis, 1898, and Mixed Paints, 1908, together with a long list of bulletins and reports, mostly on food administration and other regulatory topics. In this pioneer field of public service he was widely known and will doubtless be longest remembered.

Ohio State University.—The new judging pavilion is expected to be ready for classes next fall. It is a tile structure of from one to three stories and cost about $180,000.

Pennsylvania College and Station.—The resignations are noted of J. L. Horsfall, associate professor of economic entomology, effective July 1, and of Paul L. Fatout, J. C. Taylor, and E. J. Walter, assistant professors, respectively, of animal husbandry, poultry husbandry extension, and agronomy extension, all effective July 15. New appointments include J. M. Fry as professor of agricultural extension, Grover G. DeVault as assistant professor of agricultural economics extension, Hannah E. Honeywell, Ph. D., as assistant professor of biological chemistry, E. W. Callenbach as instructor in poultry husbandry, M. T. Lewis as assistant in plant breeding, and M. E. Smith as assistant in storage research, all effective July 1; R. B. Maxwell as instructor in storage research, effective May 1; and P. A. Frost as assistant professor of zoology, and Paul Acquarone as instructor in botany, both effective September 1.

South Dakota Station.—Much public interest is being shown in the experiment in grazing cattle, sheep, and swine on alfalfa, white and yellow sweet clover, Sudan grass, and native grass, both at the home station and at the Cottonwood Substation. Another experiment which is attracting much notice has for its object the elimination of the tails of sheep. While the work is still in a preliminary stage, in 18 lambs out of a total of 21 produced the tails do not need shortening.

Wisconsin University and Station.—Six experimental blueberry plats were recently established in Juneau County to ascertain the possibilities of blue-

berry culture in central Wisconsin. The plants for this purpose were obtained from an eastern nursery. By cooperating with local residents it is hoped that wild plants may be located during the season which will also be suitable for transplanting to trial plats later on.

As a result of a recent conference held at Wisconsin Rapids, six demonstration forest plantations of 3 acres each have been established in Portage, Wood, Juneau, Adams, Clark, and Eau Claire Counties. Both cut-over land and abandoned fields have been planted in these demonstrations. The planting stock was furnished by the State Conservation Commission, and county agents and the extension forester were in charge of the planting. Jack pine seedlings were used in all cases except the Clark County demonstration field, where the heavier type of soil warranted the use of white pine. The trees are planted 6 ft. apart, and usually two men can plant about an acre per day. Norway pine seedlings will be available for planting next year and will probably be tried out on the better sandy soils. The work marks a new venture in the Wisconsin forestry program and is expected to stimulate more interest in this field. The county board of Clark County has already appointed a forestry committee as a result of the efforts of the county agent.

An industrial fellowship of $3,200 has been established in the department of agricultural chemistry to obtain impartial data on vitamins in cereals.

New Journals.—*Biologia Generalis*, an international journal of general biology, is being published at Vienna and at Baltimore by a corps of editors headed by Leopold Löhner, Dr. Raymond Pearl, and Vladislav Růžička. Its columns will be open to original articles in general morphology, physiology, and ecology, and may be submitted in English, French, German, Italian, or Russian. The initial number contains a biographical tribute to the late Dr. Jacques Loeb; An Experimental Study on the Partial Albinism in Himalayan Rabbits, by L. Kaufman; Are the Intervening Cells of the Testicular Tissue of Suckling Animals Gland Cells? by K. Wagner; Studies on the Acceleration of the Regeneration Process Through the Use of Stimulants, by M. Popoff; Investigation on the Assimilating Capacity of Aquatic Animals for Foodstuffs Dissolved in Water, by J. Křiženecký; and A Study on the Activity of Malign Cells, by B. Sokoloff.

The Journal of Land and Public Utility Economics is being issued quarterly by the Institute for Research in Land Economics and Public Utilities, and with Dr. R. T. Ely as editor in chief. The initial number contains 10 original articles, together with book reviews, summaries of research, and comments on legislation and court decisions. Among the original articles are Research in Land and Public Utility Economics, by Dr. Ely; Land Ownership in England Since the War, by Sir Henry Rew; Forestry and Land Development in the Lake States, by R. Zon; Place of Tenancy in a System of Farm Land Tenure, by G. S. Wehrwein; and Farm Mortgage Rates, by C. F. Wigder.

Economic Geography is a quarterly being published by Clark University. The initial number contains original articles entitled The Relation of Geography of Timber Supply, by W. B. Greeley; The Potential Supply of Wheat, by O. E. Baker; The Grain Trade of Montreal, by C. F. Jones; The Coal Resources of Canada, by M. J. Patton; A Land Policy of the Public Domain, by G. R. Stewart; The Relation Between the Distribution of Population and of Cultivated Land in the Scandinavian Countries, Especially in Sweden, by O. Jonasson; together with reviews of geographical books, news notes, etc.

LIBRARY
TNAU, Coimbatore - 3

EXPERIMENT STATION RECORD

Vol. 53 AUGUST, 1925 No. 2

The supplying of bibliographical assistance has been one of the earliest and most characteristic services which the Federal Department of Agriculture has been able to render in the promotion of research. It has always been an important function of the Office of Experiment Stations, as the representative of the Department in furnishing to the experiment stations "such advice and assistance as will best promote the purpose" of the Hatch Act and its supplementary legislation. The establishment of *Experiment Station Record* in 1889 was practically contemporaneous with the commencement of the publication of results obtained by the use of the Federal funds, and its development into an abstract journal of the world's agricultural research followed quite rapidly and logically. Subsequently there appeared the Card Index of Experiment Station Literature, begun in 1890 and continued until 1921 as a ready reference to the principal station work; the monthly list of new station publications issued since 1904; and the voluminous collection of bibliographical material prepared for the Association of American Agricultural Colleges and Experiment Stations as a part of its bibliographer's reports, and incorporated as a part of its proceedings, a practice essentially maintained under the reorganization as the Association of Land-Grant Colleges. Notable bibliographical assistance has also been rendered from time to time by several other bureaus of the Department and by the Department Library.

Within the past few months a number of additional bibliographical aids have been brought out by the Department, and others have reached the stage where it is expected that they will shortly become available. One of these, which has already been issued, is a list of the abbreviations employed in the *Record* for titles of periodicals. This is a revision and enlargement of a similar list published in 1905 and covers the period 1915-1924. It includes abbreviations and full titles of periodicals, other than those of experiment station publications, from which abstracts are made for the *Record*. In the interest of consistency in making abbreviations for new periodicals, there is added a list of abbreviations of the principal words commonly used in the titles listed.

The rapid growth of the periodical literature making direct or indirect contributions to agricultural science is shown by the fact that whereas the list published in 1905 contained only 1,600 titles,

the present list contains about 3,600 titles in 15 or more languages. For the newer periodicals, fully 2,000 in number, there has hitherto been available to the reader of the *Record* no key to the abbreviated titles which have been employed. The completion of this list will be of special service in this direction, and despite the limited edition it is hoped to meet the needs of all libraries in which a reference set of the *Record* is maintained.

Through the cooperation of the Department Library and other institutions, the *Record* has access in its abstracting to what is doubtless the most complete collection of periodical literature pertaining to agricultural research which has yet been assembled. This list of periodicals therefore has a unique value as a catalogue of the world's periodical literature in this field. The practical value of this feature is materially increased by the inclusion in the list of the place of publication and by the insertion of notes indicating changes in title and similar data. It is realized that in a list of this sort changes are constantly occurring and that errors are unavoidable, but unusual care has been taken to insure accuracy, and it is hoped to keep it as nearly current as possible by the preparation of occasional supplements and further revision.

Another help to the users of the *Record*, for which many requests have been received, will be another of the general indexes. Various causes have delayed the completion of such an index since that appearing in 1913, but the manuscript for another volume is now in press and it is expected that a restricted edition will ultimately be available for distribution. The new index will cover volumes 26 to 40, and while some economies and variations have been incorporated, it will resemble its two predecessors in general arrangement and make-up.

The appearance of this general index is expected to prove of decided advantage in consulting the *Record*. Not only will it materially reduce the mechanical labor of a search through the 15 individual indexes which it will replace, but its preparation has afforded an opportunity to improve the uniformity and consistency of the entries by bringing together under a common heading items previously separated by slight variations in wording. The avoidance of such variations from year to year with changing personnel, slight differences in terminology, and similar conditions is a well recognized difficulty in indexing a continuing publication such as the *Record*, and the combined index when carefully and intelligently assembled and edited is probably the most effective remedy. It should be not only a more convenient index but one which is better and even more reliable.

A third publication in preparation by this office is another supplement to the combined list of experiment station publications now

terminating with 1922. It is hoped that the usefulness of this compilation may be enhanced by the addition of author and subject indexes.

Of the numerous bibliographical aids which are being compiled in the Department elsewhere than in this office, special mention should be made of two important series in multigraphed form, the Bibliographical Contributions of the Department Library and the Agricultural Economics Bibliographies issued from the Bureau of Agricultural Economics. The library series was instituted in 1919 with a check list prepared in the Bureau of Plant Industry of the publications of the Department on plant pathology, issued between 1837 and 1918. Later numbers in this series prepared in the same bureau have included a check list of publications of the State experiment stations on plant pathology from 1876 to 1920, an author and subject index to the corresponding publications of the Department on that subject, and a check list of all the publications of the Bureau of Plant Industry and its predecessors covering the period from 1862 to 1901. From the Bureau of Agricultural Economics there have appeared a bibliography on the preservation of fruits and vegetables in transit and storage, an index to some sources of quotations of current prices, and a selected bibliography on the world food supply. The Bureau of Animal Industry has contributed a partial list of the publications on dairying issued in the United States from 1900 to June, 1923.

The bibliographical series of the Bureau of Agricultural Economics was begun last January with a selected list of references on agricultural economics. A similar list of references on flour milling and breadmaking, what is described as "a beginning of a bibliography of the literature of rural life," a selected list of references on price spreads, and a compilation of views as to long-time agricultural programs in the United States indicate the range of subject matter which has since been included in this new series.

From the Bureau of Home Economics have come two selected lists of direct interest to home economics workers. One of these deals with Government publications on foods and nutrition, and the other lists and briefly summarizes about 50 Government publications on textiles and clothing.

Most of the bibliographical material to which reference has been made has been assembled by library workers of the Department, each compilation representing an independent project. Not infrequently, however, compilations of references become necessary in the investigation of specific problems, from which bibliographies of wider application may be conveniently prepared. Such an instance recently occurred in the Bureau of Public Roads in connection with

a study of the effect of soil alkalies on concrete draintile. A by-product of this investigation, so to speak, was the issuance as a Department bulletin of a bibliography relating to soil alkalies, compiled with special reference to the deleterious action of soil alkalies and various other chemical agents on cement and concrete. This bibliography is believed to be fairly complete in respect to articles published prior to 1924.

When carefully and intelligently compiled, bibliographies perform a very helpful service to investigators and others. An inevitable limitation upon their usefulness, however, is that they can not long include the current literature. Abstract journals are likewise handicapped, despite their periodical appearance, by the considerable interval which must elapse between the receipt of an article to be abstracted and the publication of the abstract itself. The *Official Record* of the Department, which is issued weekly, is helping to bridge over this period by bringing to public notice quite regularly and promptly the appearance of various new publications. Brief reviews are being presented of the Department bulletins and certain additional publications, and lists are given of the station publications as received, week by week, in the library of the Office of Experiment Stations. Lists of the many articles by Department workers in current publications outside the Department's own series and of the principal books and new journals received by the Department Library also afford valuable clues to recent work of interest and promise.

An intimate and comprehensive acquaintance with what is already known is so essential an element in the selection and prosecution of a research project as to require little discussion, yet its attainment is by no means universal. Not a few contributions to science are still made known through channels well off the main course of travel, and without the aid of abstract journals, bibliographies, and similar aids the search for these would not infrequently prove as arduous and elusive as that for the proverbial needle in a haystack. Isolated research institutions can hardly be expected to have fully available on their shelves the enormous and ever-increasing output of the world's scientific workers, and even if they were so situated the utilization of the material would be a tremendous and highly specialized task, and one which would be expensive and uneconomical indeed if attempted on an individual basis. Viewed from this standpoint, the preparation of abstracts and bibliographies and the like and the rendering of expert assistance along these lines appears to be a most logical and appropriate function for a national public service agency such as the Federal Department of Agriculture. There are many indications that its efforts in these directions are being increasingly recognized as unique and well-nigh indispensable.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Recent advances in protein chemistry, H. B. VICKERY (*Indus. and Engin. Chem., 16 (1924), No. 10, pp. 1029, 1030*).—This is a brief review and discussion of recent advances in the chemistry of proteins, including methods for their separation and estimation and studies on their chemical nature, with suggested problems for future study. A list of 25 references to the literature is appended.

Gluten quality, C. B. KRESS (*Cereal Chem., 1 (1924), No. 5, pp. 247–250, fig. 1*).—This general discussion includes a description, with illustration, of an apparatus which at one operation records a curve showing the resistance of a particular gluten to stretching, the distance that it can be stretched before breaking, and the character of the break.

Some critical considerations of the gluten washing problem, D. B. DILL and C. L. ALSBERG (*Cereal Chem., 1 (1924), No. 5, pp. 222–246*).—Essentially noted from a preliminary report (E. S. R., 52, p. 112).

The composition of soya bean oil, E. S. WALLIS and G. H. BURROWS (*Jour. Amer. Chem. Soc., 46 (1924), No. 8, pp. 1949–1953*).—A portion of the sample of soy bean oil used by Baughman and Jamieson in their study of the composition of this oil (E. S. R., 48, p. 607) has been subjected to analysis by the Twitchell method.[1] The percentage composition of the oil as thus determined was myristic acid 0, palmitic acid 10, stearic acid 2, arachidic acid 1, and linolenic, linolic, and oleic acid 88 per cent. The chief difference in composition as determined by the two methods is in the distribution of palmitic and stearic acids. The percentages of these acids calculated from the data of Baughman and Jamieson are palmitic 6.8 and stearic 4.4. No explanation of this difference is suggested.

Recent progress in the chemistry of pectin and its industrial applications, W. H. DORE (*Indus. and Engin. Chem., 16 (1924), No. 10, pp. 1042–1044*).—This is a review of the literature on the chemistry, industrial manufacture, economic aspects, and uses of pectin. A list of 16 references to the literature is appended.

The non-volatile acids of the peach, E. K. NELSON (*Jour. Amer. Chem. Soc., 46 (1924), No. 10, pp. 2337, 2338*).—The study reported supplements an earlier investigation by Power and Chesnut (E. S. R., 46, p. 202). The nonvolatile acids were found to consist principally of a mixture of *l*-malic acid and citric acid in almost equal proportions.

The non-volatile acids of the dried apricot, E. K. NELSON (*Jour. Amer. Chem. Soc., 46 (1924), No. 11, pp. 2506, 2507*).—In an investigation similar to the above, the nonvolatile acids of the dried apricot were found to consist of a mixture of about 25 parts of *l*-malic to 10 parts of citric acid, with traces of an unidentified acid which may be oxalic acid.

Effect of ammonium chloride upon the growth of yeast and the hydration of gluten in beer wort, E. I. FULMER, F. F. SHERWOOD, and V. E. NELSON (*Indus. and Engin. Chem., 16 (1924), No. 9, p. 921*).—The conclusion drawn in

---

[1] Jour. Indus. and Engin. Chem., 9 (1917), No. 6, pp. 581–584.

a previous paper (E. S. R., 45, p. 565) that in a synthetic medium the concentration of ammonium chloride optimum for the growth of yeast is identical with the concentration at which wheat gluten is least swollen has been substantiated with a complex medium of wort to which ammonium chloride had been added. In this medium a lower concentration of ammonium chloride was required, both for the maximum growth of yeast and the minimum hydration of gluten, than in the synthetic medium, indicating that there is present in wort something that plays a similar rôle to the ammonium ion.

The general conclusion drawn from this and the previous study is that if the addition of ammonium salt to a medium increases its ability to dehydrate gluten, the medium will also be improved for the growth of yeast.

The proteolytic action of Bacillus granulobacter pectinovorum and its effect on the hydrogen-ion concentration, W. H. PETERSON, E. B. FRED, and B. P. DOMOGALLA (*Jour. Amer. Chem. Soc., 46 (1924), No. 9, pp. 2086–2090*).—*This contribution from the Wisconsin Experiment Station presents the results* of a study of the proteolytic changes brought about in a 5 per cent corn mash by the action of *B. granulobacter pectinovorum*, with data on the H-ion concentration and titratable acidity of the medium, the determinations being made 12, 24, 48, and 96 hours after the inoculation.

The data show rapid and continuous hydrolysis of the protein, the soluble nitrogen increasing at the rate of about 200 mg. per 100 gm. of corn in 24 hours. The increase was at first mainly in the form of protein or intermediate products, but after the first 24 hours the intermediate products increased more slowly and the amino acid and peptide nitrogen more rapidly. At the end of 96 hours most of the nitrogen was in the form of proteoses, peptones, and peptides.

The figures for titratable acidity at the beginning and at each time period were as follows: 0.2, 2.8, 4.4, and 1.8 cc. of N/10 acid in 10 cc. of mash. Corresponding figures for the H-ion concentration were pH 6, 4.4, 4.1, and 4.4. The latter figures show that the original corn possessed but little buffer action, but that with the formation of products of protein hydrolysis there was a considerable increase in buffer action.

The iso-electric point of malt amylase, H. C. SHERMAN, A. W. THOMAS, and M. L. CALDWELL (*Jour. Amer. Chem. Soc., 46 (1924), No. 7, pp. 1711–1717, fig. 1*).—Further evidence of the protein nature of malt amylase (E. S. R., 51, p. 804) is furnished by the results obtained in determinations of the isoelectric point of purified malt amylase by electrophoresis in solutions adjusted by means of buffers to a wide range of H-ion concentration. A special apparatus for conducting the experiment is described and illustrated, and typical results obtained with two purified preparations of malt amylase are reported.

These preparations behaved alike in showing a definite migration of the enzyme toward the cathode or anode, depending upon the H-ion concentration. The concentration at which the change in direction took place was between pH 4.3 and 4.5. This value, representing the isoelectric point of the malt amylase, coincides with its optimum enzymic action upon starch.

Two forms of a constant water-level device, H. D. WILDE, JR. (*Indus. and Engin. Chem., 16 (1924), No. 9, p. 904, figs. 3*).—Descriptions with illustrations are given of two forms of a constant water-level device which are said to have the following advantages over the common form: "They are easily made from materials found in any laboratory; they do not require a hole in the side of the bath, and therefore they do not injure the vessel and may be used with glass or stoneware vessels; they may be readily changed from one vessel to another; and they are easily adjusted to maintain the water level at any desired point."

A simple calorimeter for small animals [trans. title], R. WAGNER (*Ztschr. Biol., 82 (1924), No. 2, pp. 114–118, figs. 2*).—The respiration calorimeter, which is described and illustrated, is constructed from two Dewar flasks, one to contain the animal and the other the cooling system. The two flasks are connected by means of an air thermometer which consists of a capillary tube containing a drop of petroleum colored with Sudan and terminating inside the flasks in cylinders of copper foil. The tube is connected outside each flask with an inlet tube provided with stopcocks. Before the experiment begins these stopcocks are opened to allow the air in both flasks to reach the same temperature and are closed during the experiment proper, when water is circulated through the cooling system.

A new direct nesslerization micro-Kjeldahl method and a modification of the Nessler-Folin reagent for ammonia, F. C. KOCH and T. L. MCMEEKIN (*Jour. Amer. Chem. Soc., 46 (1924), No. 9, pp. 2066–2069*).—The method described employs a 30 per cent solution of hydrogen peroxide as oxidizing agent to hasten the Kjeldahl digestion and a modified Nessler-Folin reagent which is said to obviate the turbidity sometimes noted with the usual reagent. The Nessler reagent is prepared essentially as follows:

To a solution of 22.5 gm. of iodine in 20 cc. of water containing 30 gm. of potassium iodide is added 30 gm. of metallic mercury. The mixture should be kept cool and shaken frequently until the supernatant liquid has lost all of the yellow color due to iodine. A portion of the liquid is tested for iodine with starch solution. If the test is negative iodine is added drop by drop to the total solution until a portion gives a faint iodine reaction with the starch solution. The solution is then diluted to 200 cc., mixed well, and added to 975 cc. of an accurately prepared 10 per cent sodium hydroxide solution.

Analyses are reported of several pure nitrogen-containing substances by this method and comparative results by the Kjeldahl, the modified macro-Kjeldahl, and the new micro-Kjeldahl methods on milk, urine, and blood.

Effects of the method of desiccation on the nitrogenous constituents of plant tissue, K. P. LINK and E. R. SCHULZ (*Jour. Amer. Chem. Soc., 46 (1924), No. 9, pp. 2044–2050, figs. 2*).—In continuation of the study of the effects of desiccation on the composition of plant tissue (E. S. R., 49, p. 9), determinations were made of the changes in the nitrogenous constituents of the leaves of the sugar beet collected from nearly mature plants on a cool, cloudy day in September, the leaves and ears of corn collected simultaneously from plants in the early milk stage on a hot, dry day in August, and the leaves of common barberry collected during a hot, dry period in August. The methods of preparation of the tissues were the same as in the previous study, and the temperatures for drying were room temperature (32° C.), 45 and 65° with forced ventilation, and 80 and 98°. For comparison, similar determinations were conducted on extracts prepared from the fresh tissues.

None of the four types of tissues used showed any loss of total nitrogen on desiccation. The beet leaves showed marked loss in total water-soluble nitrogen, particularly at the higher temperatures, nearly as great a loss of coagulable nitrogen, and increases in proteoses and simpler forms of nitrogen at temperatures of 32 and 65°, indicating hydrolytic decomposition of the compound. The corn leaves showed an increase in total water-soluble nitrogen except at 98°, at which temperature there was a decrease, a decrease in coagulable nitrogen at 32 and 98°, and no change in α-amino nitrogen except at 32 and 98°. The corn ears showed a decrease in soluble nitrogen above 80° and in total coagulable nitrogen at all temperatures. The changes in the simpler forms of nitrogen were irregular and indicated counterbalancing

effects. The nitrogenous constituents of the barberry leaves remained unchanged. The most important fact brought out by these results is that each tissue represents a separate case, so that no general conclusions applying to all types of tissue can be drawn concerning the effect of desiccation.

The colorimetric determination of carbohydrates in plants by the picric acid reduction method, I, II (*Jour. Amer. Chem. Soc., 46 (1924), No. 7, pp. 1662–1675*).—This contribution from the Pennsylvania Experiment Station consists of two papers, as follows:

I. *The estimation of reducing sugars and sucrose*, W. Thomas and R. A. Dutcher (pp. 1662–1669.)—The Benedict-Osterberg picric acid reduction method (E. S. R., 39, p. 112) with precautions suggested by Falk and Noyes (E. S. R., 43, p. 414) has been applied to the determination of small quantities of sugar in the leaves and spurs of apple trees as a part of an investigation of the effect of fertilizers on the physiological functions of the apple (E. S. R., 49, p. 617).

In adapting the method, an attempt was made to use lead acetate as a clarifying agent, but this was found to be less satisfactory than the mercuric nitrate employed in the original method. The reliability of the method was tested by comparison with the Quisumbing-Thomas gravimetric method (E. S. R., 46, p. 113) and by recovery of glucose and fructose added in known amounts. More uniform and consistent results were obtained and in much less time with the colorimetric than with the gravimetric method. The recovery of added glucose varied from 99 to 100.5 per cent in the case of the spurs and from 99 to 101.33 per cent in the case of the leaves.

The method was also found applicable to the determination of sucrose in the plant tissue after inversion.

II. *The determination of starch and other "reserve" polysaccharides*, W. Thomas (pp. 1670–1675).—The method described in the previous paper has also been applied to the determination of starch after a single hydrolysis with taka-diastase.

In a series of 19 experiments using 0.25 gm. of starch and 8 using 0.1 gm. the ratio of glucose to maltose ranged from 1.9 to 2.3, with an average value of 2.05. The analytical error introduced by considering this ratio as 2 was found to be very small. For determining other reserve polysaccharides, hydrolysis with 0.5 per cent hydrochloric acid, followed by the colorimetric procedure, is recommended.

The electrical method for determining soil alkali, A. F. Joseph, F. J. Martin, and J. S. Hancock (*Cairo Sci. Jour., 12 (1924), No. 115, pp. 141–143*).—Evidence is presented that the electrical method of determining salt in soils described by Beam and Freak (E. S. R., 32, p. 806) does not give correct indications of the amount of calcium sulfate in the soil.

On the effect of wear on small mesh wire sieves, B. A. Keen and W. B. Haines (*Jour. Agr. Sci. [England], 13 (1923), No. 4, pp. 467–482, pl. 1, figs. 9*).—Studies conducted at the Rothamsted Experimental Station are reported, the purpose of which was to measure the uniformity of new sieves for preparing samples of fertilizer and to compare these with used sieves. A series of measurements of wire diameter, length of side, and area of holes was made on new and used sieves, all of which were originally of the 100-mesh size, and the square holes were supposed to be 0.01 in. in length of side and the wire to be 0.01 in. in diameter.

Unused sieves on the whole compared quite well with this specification, but in the used sieves the variations were much greater. In one sieve the holes were elongated more in one direction than in the other, and in one direction the alteration was a contraction rather than a stretch. A number of the fre-

quency curves showed double peaks, and the actual observations showed that there was a systematic distribution of values according to these two peaks.

A comparison of the double and single systems of weaving showed that the latter appeared preferable for maintaining uniformity of hole dimensions in use, since the wires gripped one another more tightly and oftener.

Determination of phosphoric acid in fertilizers, J. E. BRECKENRIDGE (*Indus. and Engin. Chem., 16 (1924), No. 11, p. 1180*).—To overcome the disturbing effect of sulfates on the determination of phosphoric acid in fertilizers by the Official volumetric method, the author recommends a preliminary precipitation with barium nitrate as follows:

A 2-gm. sample is boiled for 30 minutes in a 200-cc. flask with 30 cc. of nitric acid and a few cubic centimeters of hydrochloric acid, after which 50 cc. of water is added and the solution boiled again. While still hot, 5 per cent barium nitrate solution is added (50 cc. for acid phosphate and 25 cc. for mixed goods), the mixture is cooled, and the determination continued as in the Official volumetric method.

Counting yeast cells in dough, H. E. TURLEY (*Cereal Chem., 1 (1924), No. 5, pp. 261–267*).—The author has developed a method for counting yeast cells in dough which is said to yield consistent and accurate results. The method consists essentially in breaking down the proteins of the dough sample by digestion with pepsin, checking the further growth of the yeast by means of phenol, staining the yeast cells with Loeffler's methylene blue, and counting them by the usual method.

A comparative study of methods for determining total solids in ice cream, R. C. FISHER and C. C. WALTS (*Jour. Dairy Sci., 7 (1924), No. 6, pp. 576–584*).—A comparison was made of three methods of determining total solids in ice cream. These included a test adapted from the Official method for condensed milk, a modified method similar to the one previously described for sweetened condensed milk (E. S. R., 52, p. 315), and the Mojonnier test.

In all 50 samples of ice cream were analyzed, 12 by all three methods, and the others by the Mojonnier and the so-called modified method. In most cases the results obtained by the three methods agreed fairly closely. As was true with condensed milk, the highest results were obtained with the Mojonnier and the lowest with the Official method. Using the Official as standard, the average difference was 0.228 per cent for the modified and 0.483 per cent for the Mojonnier method. A series of observations as to the time required to reach constant weight in the modified method indicated that for all practical purposes two hours of drying in the water oven are sufficient, but that for careful analytical work the time should be extended to three hours.

The modified method is recommended as a simple, economical, and accurate method for determining the percentage of total solids in ice cream.

Adulterated acid as a possible source of error in testing milk by the Babcock method, W. E. PETERSEN (*Jour. Dairy Sci., 7 (1924), No. 4, pp. 361–369*).—Attention having been called to the possibility of adulterating the sulfuric acid used in the Babcock test for the purpose of increasing the fat readings, a study was made of the results obtained on adding to concentrated sulfuric acid fats or oils, fat solvents, and a combination of the two.

The fats and oils tested included various animal and vegetable fats and oils and mineral oils. With all a 2 per cent addition gave a marked increase in the fat readings, but also so changed the appearance of the acid that the adulteration could be easily detected. The fat solvents, gasoline, benzene, etc., floated on top of the acid and might be detected easily on this account or from the irregularity in readings obtained. With the exception of butter, the addition of saturated solutions of fats in fat solvents so changed the color of the

acid and the fat column that their presence could be detected easily. A saturated solution of butterfat in benzene, gasoline, or ligroin did not change the appearance of either the acid or the fat column, and its presence could be detected only by running a blank test on the acid.

A colorimetric picric acid method for determining lactose, H. R. BIERMAN and F. J. DOAN (*Jour. Dairy Sci., 7 (1924), No. 4, pp. 381–392*).—This contribution from the Maryland Experiment Station consists of an application of the Folin-Denis modified picric acid method of determining lactose in milk (E. S. R., 38, p. 615) to various dairy products. The principal change from the Folin-Denis method was the use of a saturated picric acid solution as the standard for all determinations, the error thus introduced being overcome by the use of a table of factors based on 118 determinations made on 58 different lactose solutions varying 10 mg. in concentration between individual solutions.

The technique of the procedure is described for the various dairy products, and data are presented on its accuracy. These data indicate that the method is as accurate as the various Official methods, and has the advantage of being less complicated and requiring fewer and more easily prepared reagents.

Modified method for determining cellulose in wood, G. J. RITTER (*Indus. and Engin. Chem., 16 (1924), No. 9, pp. 947, 948*).—Cellulose was prepared by various modifications of the method described in a previous paper (E. S. R., 51, p. 114) in the hope of eliminating the gelatinous properties and subsequent discoloration on drying. Of the modifications studied, which included decreasing the length of the chlorination period, substituting hydrogen peroxide and sulfur dioxide for permanganate as a bleaching agent, and digesting the cellulose on a hot water bath before final washing, the last one alone improved the condition of the cellulose. Slow digestion of the cellulose with hot water for two hours was found to reduce the hot water-soluble content of the cellulose to approximately 1 per cent. The cellulose thus prepared could be washed with water and filtered easily.

The determination of free calcium hydroxide in commercial calcium arsenate, C. M. SMITH and S. B. HENDRICKS (*Indus. and Engin. Chem., 16 (1924), No. 9, pp. 950, 951*).—The method described consists in shaking for 5 or 6 minutes a 1-gm. sample of the material with 50 cc. of an approximately N/10 solution of benzoic acid in 93 per cent alcohol and titrating the excess of acid with N/10 sodium hydroxide in 93 per cent alcohol, with phenolphthalein as indicator. The solution should be shaken violently during the back titration. For the most accurate results it is recommended that the titration be stopped somewhat before the end point, the solution filtered through a folded filter paper, the latter washed once or twice with alcohol, and the clear filtrate titrated to the first appearance of pink. Data reported show that results within about 0.15 per cent of the correct values can be obtained without filtration.

Some chemical problems of the insecticide industry, J. K. DICKERSON (*Indus. and Engin. Chem., 16 (1924), No. 10, pp. 1013–1015*).—This is a general discussion of the relation of the chemist to the manufacture and application of insecticides and fungicides, with suggestions as to problems still awaiting solution.

Adsorption effects of filtering materials on sugar solutions, G. H. HARDIN and F. W. ZERBAN (*Indus. and Engin. Chem., 16 (1924), No. 11, pp. 1175–1177, figs. 2*).—This paper reports a study of the effect of commonly used filter materials such as filter paper, absorbent cotton, asbestos, and Filter-Cel on the concentration of sugar solutions as determined by polariscope readings.

Most of the tests were made with ordinary filter paper. The factors studied included quantity, quality, and moisture content of the filter paper, the concentration of the sugar solution, and the time of contact between the two. The weight and moisture content of the paper and the concentration of the solution exerted the greatest effect. Perfectly dry paper gave a decided increase and moist paper a decrease in polarization. Dry absorbent cotton acted about the same as dry filter paper, but Filter-Cel and dry asbestos brought about no change.

It is considered that while theoretically the best procedure would be to use filtering materials which had no effect on the concentration or filter paper of such moisture content as to have no appreciable effect, both of these measures present considerable difficulties. If dry filter paper is used, it is considered necessary to discard at least the first 25 cc. of the filtrate.

Manufacture and uses of refined dextrose, W. B. NEWKIRK (*Indus. and Engin. Chem., 16 (1924), No. 11, pp. 1173–1175, figs. 2*).—This is a discussion of some of the technical features of the process of manufacturing dextrose described by Porst and Mumford (E. S. R., 47, p. 508), together with suggested uses for the product. It is considered superior to sucrose in the manufacture of high-grade candies, icing, etc., for preserving fruits of mild or delicate flavor, as the yeast nutrient in bread sponge, and in the manufacture of ice cream, crullers, and condensed milk.

[Sorgo studies at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1923–24, p. 17*).—Records covering several years on the sugar content of 15 varieties of sorgo indicate that the maximum content of sugar is reached at different periods (from 90 to 135 days) by the different varieties. The sucrose content of the juices tested varied from 10 to 17.4 per cent. Sumac and Orange sorgos proved the best for sirup making both in quality and quantity. Determinations of tannin in 9 varieties of sorgo gave yields varying from a trace in White and Dawn kafir to 0.5 per cent in Orange sorgo and Darso.

METEOROLOGY

Climate and weather influence on the fruit industry of the United States, J. B. KINCER (*Bul. Amer. Met. Soc., 6 (1925), No. 1, pp. 12–14*).—The climatic limitations and requirements of different kinds of fruit are briefly defined.

The poleward limit of growth of the hardier varieties is stated to correspond approximately with a mean winter temperature of 20° F.

The risk of winter injury to twigs or buds or of spring frost injury to advanced buds or blooms is especially increased by lack of proper maturity in the fall or premature swelling in the spring.

"The low temperature danger point for fruit blossoms, or for fruit just set, ranges in most cases from 27 to 29°, and varies only slightly for different varieties, though in the case of apricots, plums, and prunes it is somewhat higher. Well developed buds will withstand a lower temperature than after they have opened. The physical process which enables them to withstand temperatures considerably below freezing is the subcooling of their capillary liquids. This cooling below the freezing point of water, without the actual formation of ice, is due largely to the presence of chemical substances held in solution."

A long series of observations at one place in Ohio is cited to show that "the apple blooms there on the average only about five days later than the average date of the last freeze, while in 40 per cent of the years freezing weather occurs after full bloom. In the case of some earlier-blooming fruits, such as

the cherry and plum, the margin is in favor of the frost by two or three days on the average. These records show also that in this locality there is a very close relation between the temperature during the last ten days of March and the month of April and the time of blooming, the coefficient of correlation between the mean temperature for this period and the date of blooming being +0.88.

"Aside from the heavier winter injury in the Central-Northern States than elsewhere, there is no marked variation in frost risk to fruit in different sections of the country. That is to say, the earliness or lateness of blooming in relation to the time of last killing frost in spring is substantially the same in all sections, and this is true with regard to difference in general elevation. The average date of retardation in blooming from south to north is approximately one day for each 15 miles, and the lag of the average date of the last killing frost in spring is substantially the same. Again fruit trees bloom progressively later at an average rate of one day for each 100 ft. with increase in elevation, and the average date of last killing frost has a corresponding lag."

This generalization with reference to elevation, however, does not hold in local variations of topography, especially with alternating slopes and depressions. In this case the lower land is more subject to frosts than the higher and should therefore be avoided for orchard planting.

Orchard heating is referred to as generally successful and profitable.

Fruit-spray and harvest-weather forecast work of the Weather Bureau in New York State, E. B. CALVERT (*Bul. Amer. Met. Soc., 6 (1925), No. 1, pp. 15, 16*).—This is a brief statement regarding the fruit spray service (April to June) and harvest weather forecasts (June to August), established through the Weather Bureau office at Ithaca, N. Y., in 1919 and 1921, respectively. These services are based primarily on the prospect of rain or prolonged damp weather, conditions favorable to the development of disease and unfavorable to harvesting. The services appear to have given general satisfaction.

Cotton growing in relation to climate in Egypt and the Sudan, C. B. WILLIAMS (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 47 (1924), pp. 31, pls. 10*).—This is a progress report on a study in which use was made of an amplification (taking account of sunshine and wind as well as temperature and rainfall) of a diagram method outlined in a paper previously noted (E. S. R., 50, p. 415). In this diagram the stage of growth is one ordinate and the particular climatic feature being studied the other. Climatic data recorded at five representative places in Egypt and four in the Sudan are used in this study.

It is shown that "Egypt is an example of the type of country in which cotton is grown in a warm period between two colder periods and is planted on a rising temperature, while in the Sudan the cotton is grown in a cool period between two warmer periods and the cotton is planted on a falling temperature. . . . Planting is done in Egypt at temperatures varying from 15 to 17° C. [59 to 62.6° F.] and in the Sudan from 26 to 33°. The similarity of the conditions is greatest about one or two months before picking commences. . . . About one month before picking every single locality in the Sudan is at a lower mean temperature than any locality in Egypt. . . .

"Although the temperatures in the Sudan are frequently very high and in Egypt are often low, owing to the difference in the cotton season the conditions of growth are more similar and the growing cotton escapes the very hot weather in the Sudan and the winter in Egypt. In fact as regards mean temperature, the cotton actually matures at a lower temperature in the Sudan than it does in Egypt."

Little of the cotton in these regions is rain grown. It is important, however, to note that "the rainfall is always low at the end of the growing period

and the beginning of the picking period. The relative humidity and evaporation vary enormously in the different localities.

"Cotton in the Sudan is probably grown with less daylight (sunrise to sunset) than any other country, as it is a winter crop farther away from the Equator than any other winter grown cotton."

Relative humidity and forest fires, L. F. Cronemiller (*West Coast Lumberman, 47 (1925), No. 561, pp. 51, 52, fig. 1*).—A comparative study of relative humidity and fire losses in Oregon confirm the accepted danger point of 35 per cent humidity for 3 or more days for western Oregon, but indicate that 20 per cent should be taken as the danger point for the eastern part of the State.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and J. Bower, jr. (*Massachusetts Sta. Met. Buls. 435–436 (1925), pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1925. The data are briefly discussed in general notes on the weather of each month.

Weather conditions and crops, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 15–17*).—Data for temperature, precipitation, and frost-free period at the Northwest Experiment Station at Crookston, Minn., during 1923 and previous years and on cloudiness and wind during 1923 are reported, with brief comments on the effect of the weather on crops and cultural operations.

The mean temperature of 1923 was 40.2° F. as compared with a 10-year average of 46.8°. The total precipitation of 1923 was 16.14 in. (the actual rainfall being 14.35 in.) as compared with the 10-year average of 18.73 in. The period free from killing frosts extended from May 16 to September 13, the average dates for 27 years being May 18 to September 23.

Weather of the season, P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1923, pp. 6–9*).—Data for temperature and precipitation at Morris, Minn., 1923, as compared with previous years, and also for cloudiness, 1923, are reported, with brief comments on the character of the crop season.

"The weather during the crop season of 1923 was quite favorable for most crops. On sandy areas there was not sufficient rainfall and crops suffered. On the heavier soils which predominate throughout western Minnesota, there was sufficient moisture to mature an average crop." The precipitation in 1923 was 21.27 in., as compared with the 15-year average of 25.27 in.

Climate, J. M. Stephens et al. (*U. S. Dept. Agr. Bul. 1301 (1925), pp. 2–5, fig. 1*).—Data for temperature, precipitation, evaporation, and frost-free period at the Northern Great Plains Field Station of the Department near Mandan, N. Dak., 1913–1922, and for precipitation at Bismarck, 1875–1913, are reported.

The frost-free period of 1922 was 165 days (April 25 to October 7) as compared with the 10-year average of 134 days (May 13 to September 24). The precipitation for the year was 17.35 in., slightly above the 48-year average for the region.

SOILS—FERTILIZERS

Physical properties of forest and open country soils, H. Burger (*Physikalische Eigenschaften der Wald- und Freilandböden. Thesis, Eidg. Tech. Hochsch., Zurich, 1923, pp. 221, figs. 14*).—The results of an extensive study on the air capacity, permeability, and other physical properties of forest and meadow soils are reported in considerable detail. A detailed discussion of

the relative merits of different methods for studying the physical properties of soil is also presented.

Studies of the differences between the physical properties of forest and of open soils showed that the volume weight of the latter is considerably greater than that of the former, especially in the upper strata. The pore space in the upper strata of forest soils is therefore greater than that of the open soils. However, there is apparently no essential difference in the water capacities of the two soils in volume per cent.

The air capacity of both the upper and deeper strata was found to be greater in forest soils than in meadow soils, and the permeability, in a measure, ran parallel with the air capacity.

The difference between forest and open soils was found to lie less in the pore volume as such than in the nature of the pores themselves. Forest soils contain relatively large pores, resulting from the activity of worms and other animals and large roots. Somewhat the same condition exists in meadow soils, but to a less extent, and this is destroyed in the upper stratum by the network of grass roots and the puddling action of rain. These open pores and canals are entirely destroyed in cultivated soils. It is concluded that the evil results of clearing and cultivation of forest soils on forest maintenance rest on these differences in their physical properties.

Studies of the influence of clearing on forest soils showed that the volume weight of the upper strata of cleared forest soils increased in most cases, the pore space decreased, and the water capacity usually increased. However, the water capacity decreased in cleared forest soils containing much humus. Clearing markedly decreased the permeability of forest soils. After six or eight years cleared forest soils were found to be on a level with long-time meadow as regards air capacity and permeability.

Studies on the influence of stump removal from and cultivation of forest soils showed that in general the volume weight was increased and the pore space decreased by cultivation, while the water capacity was generally somewhat increased. The main injurious effect of stump removal was found to be in the marked decrease in permeability.

Recommendations as to further important studies of forest soils are included.

[Studies of impermeable soils at the New Mexico Station] (*New Mexico Sta. Rpt. 1924, pp. 14–17*).—A continuation of these studies showed that the impervious condition in certain irrigated soils is probably associated with the finer soil particles, and that sodium compounds very much decrease the permeability. Aluminum sulfate, tannic acid, calcium acid phosphate, magnesium sulfate, manure, and gypsum were found to assist the penetration of water into impermeable soils. The increased permeability obtained with the aluminum sulfate was found still to exist after a period of five months. A series of experiments conducted with four types of soil showed that aluminum sulfate could be added in amounts up to 2 per cent without toxic effects.

Soil [at the Northern Great Plains Field Station], C. F. Marbut (*U. S. Dept. Agr. Bul. 1301 (1925), pp. 5, 6*).—A brief description is given of the soils of the Mandan, N. Dak., tract, together with chemical analyses to a depth of 36 in.

The moors of northwestern Bohemia, H. Schreiber et al. (*Die Moore Nordwestböhmens. Prague: Deut. Sekt. Landeskulturrates Böhmen, 1923, pp. [3]+124, pls. 9*).—A large amount of data of a descriptive nature obtained from a survey of the moors of northwestern Bohemia is presented in tabular form, special attention being given to the depth, character, and drainage of the soils.

Characterization and classification of red soils [trans. title], E. Blanck and F. Alten (*Landw. Vers. Sta., 103 (1924), No. 1-2, pp. 41-72*).—Studies are reported, the results of which are taken to indicate that the quantities of aluminum and iron oxides in red soils soluble in hydrochloric acid, taken together with the determination of decrease in hygroscopicity, should serve as a basis for classifying a red soil as a Mediterranean type or a tropical type. This makes possible the differentiation of terra rossa and so-called blood loam, bohnerzton, etc., from the tropical red earths and laterites on the basis of their chemical characteristics.

Experimental contribution to the origin of Mediterranean red soils [trans. title], E. Blanck and F. Alten (*Landw. Vers. Sta., 103 (1924), No. 1-2, pp. 73-90*).—This is a highly technical contribution to the much studied subject of the origin of the Mediterranean red soils, in which the authors have attempted to solve the problem by a study of the solubility relations of the magnesium and calcium carbonates of the mother rock and by studies of the factors governing the tendency of iron to leach from these soils.

It was found that the natural magnesium carbonate is less soluble than the natural calcium carbonate. When both are present with one greatly in excess of the other, the one in minimum is the most easily soluble. However, the difficultly soluble calcium carbonate of marble is more soluble than the difficultly soluble magnesium carbonate of magnesite, and the easily soluble magnesium carbonate of marble is more soluble than the easily soluble calcium carbonate of magnesite. Further solubility studies with humus solutions led to the conclusion that red soil formation is likely to occur in limestone and dolomite regions.

The leaching studies showed that the removal of iron is hindered by the presence of lime or of colloidal humus.

Investigation on the formation of Bleichsand and Orterde in forest soils [trans. title], H. Niklas (*Forstwiss. Centbl., 46 (1924), No. 15, pp. 632-636*).—Chemical studies are briefly reported showing the great extent to which iron, alumina, potash, and phosphoric acid have been removed from so-called Bleichsand soils. Yellow loam contained almost twice as much alumina and was considered relatively rich in nutritive substances and other salts. It is thought that the relatively high nutrient content of loam soils protects them against Orterde formation.

Soil survey of Nyasaland, A. J. W. Hornby (*Nyasaland Dept. Agr. Bul. 2 (1924), pp. 4*).—Data on the mechanical and chemical composition and the fertility requirements of the prevailing soil types of Nyasaland are briefly presented and discussed.

A comparison of sand and soil temperatures in Egypt, E. McKenzie-Taylor and C. B. Williams (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 40 (1924), pp. 24, pls. 9*).—An outline is presented showing the differences and resemblances between the temperatures down to a depth of about 30 cm. (11.8 in.) in an almost dry desert sand of uniform composition and a black agricultural soil which is irregular in composition and in moisture content. The observations were taken simultaneously during a week in August, 1922, and a week in March, 1923, in two different localities near Cairo. The maximum air shade and black bulb temperatures during both periods were the same in the two localities, but the minimum air shade temperature was slightly higher in the desert and the air was considerably drier.

The moisture content of the black soil increased rapidly with depth, particularly in March, which altered the conductivity and specific heat. The maximum surface temperatures were about 8° C. (46.4° F.) higher than in the sand, both in August and in March, but the minimum temperature of the soil

was a little above that of the sand in August and a little below in March. The mean daily range at the surface, excluding cloudy days, was about 40° for the soil and about 36° for the sand in both months. Most of these differences are attributed to the difference in color between the sand and the soil, and it was found that the surface maximum of the soil was considerably reduced by a very thin layer of sand on top.

The daily range of temperature in the uniform sand was reduced by a constant factor for a constant increase of depth, particularly in March. In fact, the temperature range was reduced to almost exactly 0.58 of its previous value for each 5 cm. increase in depth. The soil results were, however, much more complicated. In March, when it was moderately damp, there was a very large reduction in range in the first 5 cm., and further irregularities at depths of from 15 to 20 cm., which are considered to be correlated with the increase in the percentage of fine particles.

The daily wave of temperature change in the ground was not symmetrically divided into equal heating and cooling portions, but the cooling portion was longer at the surface than the heating portion. The relative length of the two varied according to the season of the year. In addition a change took place on descending into the ground, when the heating period gradually increased in length and the cooling period decreased until both were equal, and then until the heating period was longer than the cooling period. At greater depths in the ground both maximum and minimum temperatures occurred later, the lag in the maximum being approximately the same in August and March, but that in the minimum being different from that in the maximum. The minimum at any depth was reached earlier in August than in March.

The soil-point method for directly estimating the water-supplying power of a soil in the field, F. Hardy (*Jour. Agr. Sci. [England], 13 (1923), No. 4, pp. 355–360*).—Studies conducted by the Imperial Department of Agriculture in the British West Indies on the value of the soil point method for estimating the water-supplying power of sugar cane soils are reported. Attention is drawn to Mason's modification of Livingston's soil-point method, in which ordinary lead writing pencils were used. The reliability of the method is indicated by a series of mean results with their corresponding probable errors. It is concluded that the method is practicable.

The effect of movement of soil salts on standardization values of electrodes used in moisture determinations, T. Deighton (*Jour. Agr. Sci. [England], 13 (1923), No. 4, pp. 440–446, figs. 2*).—Continuing work previously reported (E. S. R., 49, p. 317), studies conducted at the Cambridge School of Agriculture on the possible effects of soil salt movement on the electrical determination of moisture in soils by means of electrodes are reported.

It was found that within the degree of accuracy attained and under the conditions of the experiment, relative humidity was without effect on the soil moisture content at a depth of 3 in. With only 1 mm. of artificial rain the resistance of the electrodes buried at the 3 in. level was not effective. Another millimeter added two days later, before the first had completely evaporated, caused a distinct but small decrease in resistance which remained constant for more than a month and showed no appreciable sign of recovering itself. Later 2 mm. of rain were applied, and a short time afterwards a very marked fall was noted in the resistance between all the pairs of electrodes which gradually recovered itself in the ensuing weeks, finally reaching a point but little below that from which it started.

These results are taken to indicate that there is no sufficient reason for concluding that the resistances found subsequent to watering would have

regained their original equilibria if sufficient time were allowed. However, it is concluded that from the practical viewpoint standardization values in normal soil will apparently not be altered by every passing shower.

The determination of the number of bacteria in soil.—II, Methods for the disintegration of soil aggregates and the preparation of soil suspensions, C. L. WHITTLES (*Jour. Agr. Sci. [England], 14 (1924), No. 3, pp. 346–369, figs. 6*).—In a second contribution to the subject from the Cambridge School of Agriculture (E. S. R., 50, p. 515), an apparatus is described which has been designed to impart a known number of vibrations per minute to a suspension of soil or other material, and the problem of the calibration of this apparatus is briefly discussed. A new method for the comparison of the mechanical composition of suspensions is also described. Various preliminary treatments of samples of soil for mechanical analysis are compared, and it is shown that (1) the rate of wetting is an important factor, (2) a combination of trituration and vibration gives a satisfactory degree of dispersion, and (3) the use of acids is not advisable.

Influence of the concentration of sugar in a medium on nitrogen fixation by bacteria [trans. title], G. TRUFFAUT and N. BEZSSONOFF (*Sci. Sol [Truffaut], 3 (1924), No. 1, pp. 21–28*).—Studies are reported which showed that low concentrations of sugar of around 0.1 per cent in a medium are more favorable than the 1 per cent concentration usually employed for the development of the more common aerobic soil organisms in a medium without nitrogen or for the fixation of nitrogen by aerobic organisms. The rate of nitrogen fixation per gram of sugar transformed by two aerobic organisms was from two to three times higher when the sugar was introduced in two small additions than when given all at one time.

The destruction of vegetation and its relation to climate, water supply, and soil fertility (*Nyasaland Dept. Agr. Bul. 1 (1924), pp. 16*).—Part 1 of this publication, by F. Dixey, deals with the general effects of the destruction of vegetation, with particular reference to soil erosion. Part 2, by J. B. Clements, deals with the relation of forest vegetation to climate, water supply, and soil erosion. Part 3, by A. J. W. Hornby, deals specifically with the erosion of arable soil in Nyasaland and methods of prevention.

On the nature of the acidity appearing after the addition of soy bean cake to a rice field, K. MIYAKE and I. TAMACHI (*Jour. Biochem., 3 (1924), No. 3, pp. 305–323*).—Studies conducted at the Hokkaido Imperial University, Sapporo, Japan, are reported, in which the nature of the acidity appearing in soil water after the addition of soy bean cake to a rice field was examined. It was found that organic acids and carbon dioxide are mainly responsible for the acidity of the soil solution under these circumstances. However, titratable acidity was due mainly to soluble iron, aluminum, and manganese combined with these acids.

[Studies of niter spots by the Colorado Station], W. G. SACKETT (*Colorado Sta. Rpt. 1924, pp. 18, 19*).—A continuation of the studies of niter spots in soils (E. S. R., 51, p. 621) showed that of sulfur, alum, and ammonium sulfate, the sulfur was the only material which exercised any decided action in retarding nitrate formation. Parallel nitrate and chloride determinations failed to show any correlation between the two salts.

The leaching of potash, lime, and nitrate nitrogen out of soil [trans. title], J. VALMARI (*Abhandl. Agr. Wiss. Gesell. Finnland, No. 10 (1921), pp. 75–86*).—Studies are reported the results of which are taken to indicate that the losses of lime from soil by leaching have generally been overestimated, and that they are markedly increased by potash fertilization only under certain

The biological processes are considered the most important factors in the leaching of plant nutrients from soils. It was found that all those conditions which favor the activity of aerobic bacteria contribute to leaching losses. On the other hand conditions limiting the oxygen content of soils decreased leaching losses.

Potash losses by leaching were found to be twice as great when 37 per cent potash salt was used as where the same amount of potash was applied in the form of kainit.

Effect of fertilization and water content on nitrogen transformation in moor soils [trans. title], J. VALMARI (*Abhandl. Agr. Wiss. Gesell. Finnland, No. 10 (1921), pp. 1-74, figs. 2*).—Extensive studies are reported which showed that, while moor soils containing much easily decomposable organic matter are rapidly depleted of free oxygen on being saturated with water, the process of ammonification is not necessarily hindered. In fact, the largest quantities of ammonia nitrogen were obtained from soils which had been saturated with water. It is concluded that a water content of from 70 to 80 per cent of the total water capacity is the optimum for ammonification in such soils. A water content of from 70 to 75 per cent of the total capacity was found to be the optimum for nitrification. Increasing the water content beyond this point retarded nitrification, and at the saturation point it stopped.

Complete saturation of the soil was generally accompanied by a disappearance of the nitrate nitrogen. This is attributed to denitrification, and it is concluded that the oxygen deficiency resulting from a high water content is a primary factor in promoting denitrification. Incidentally it was also found that sulfates were reduced under these conditions.

Water content was also found to be a decisive factor in determining the reaction of such soils. Reactions varying from neutral to acid were obtained in unfertilized soils by varying the water content. When calcium carbonate was added this action was more marked.

A lively nitrification was found to take place in peat soils having a rather strongly acid reaction. This is taken to indicate that the absence of nitrates in acid soils may be due to reasons other than the reaction.

The presence of basic material such as calcium carbonate was always favorable to nitrification in these soils. However, it was found that an alkaline reaction may be injurious to nitrification in solution. Experiments with peat litter saturated with water and treated with sufficient calcium carbonate to produce an alkaline reaction showed only traces of nitrate nitrogen present.

A weakly acid reaction was found to be the most favorable for denitrification. It is concluded therefore that denitrification becomes most important in soils which were originally favorable to nitrification and have subsequently become unfavorable, usually as a result of water saturation.

The addition of 37 per cent potash salt and kainit was found to influence markedly nitrogen transformation in moor soils. These two materials had about the same effect, which apparently depended upon the concentration of the soil solution.

Phosphoric acid fertilization was found to aid in increasing the solubility of nitrogen compounds in moor soils. Such fertilization was also accompanied by a decrease in soluble nitrogen. This is attributed to denitrification, and is taken to indicate that phosphatic fertilization so hastened the oxidation processes in the soil as to result in an oxygen deficiency and subsequent denitrification. The addition of sodium nitrate and ammonium sulfate was accompanied by great losses in soluble nitrogen at first. Eventually, however, this result was reversed.

The action of sand as an amendment to moor soil was relatively insignificant. Loam was very active, however, and produced results similar to those of kainit, lime, and phosphoric acid.

The results as a whole are taken to indicate that the soil treatments which are favorable for crops are also favorable for increasing the solubility of soil nitrogen. It is further concluded that the losses of soil nitrogen by denitrification have heretofore been underestimated, and that artificial watering of soil favors the breaking down of soluble soil nitrogen compounds by this process. Furrow irrigation is therefore considered to be generally preferable to flooding.

Soil fertility and soil management experiments, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 46–56*).—Progress data are reported from experiments on the continuous cropping of small grains without fertilization; a 4-year rotation without manure, fertilizer, or legume; complete fertilization; phosphating and manuring; rate of manuring; straw utilization; and marling (E. S. R., 51, p. 119).

In the rate of manuring experiment the average yields indicated that the largest increases per ton of manure were obtained from the 4-ton application, except in the case of clover, where the 8-ton application was slightly more economical.

[Fertilizer experiments at the Morris Substation], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1923, pp. 9–23*).—Progress data are reported from experiments on phosphate and manuring rotations, the use of fertilizers on alfalfa, rates of manuring, wheat straw, and corn stover as fertilizers, and clover utilization rotation (E. S. R., 51, p. 119).

The rates of manuring experiments demonstrated that an 8-ton application of manure once in 4 years is about all that can be utilized profitably by corn or wheat. Barley was the one crop which was benefited by heavier applications of manure.

Facts brought out by soil experiments, H. F. Murphy (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 28, 29*).—The results of manuring, liming, and rotation experiments are briefly reported.

A common error in interpreting financial returns from fertilizer experiments, E. L. Worthen (*Jour. Amer. Soc. Agron., 16 (1924), No. 12, pp. 776–781, fig. 1*).—In a contribution from Cornell University it is pointed out that the more profitable of two fertilizers differing in cost can not be ascertained from the results of a single comparison of an equal rate of application of the two. The method which makes comparisons on the basis of percentage return on the investment is considered to favor the less expensive of the two treatments. The common method of interpreting financial returns by comparing two single treatments, based on the net value of the crops over the cost of the fertilizer, is considered to be generally in favor of the more expensive treatment, particularly where the fertilizer applications are small.

Comparison of urea with ammonium sulfate as a nitrogenous fertilizer [trans. title], J. Kuyper (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1924, No. 17, pp. 509–523, figs. 3*).—Experiments with sugar cane on light and heavy soils are reported which showed that, while in most cases urea and ammonium sulfate gave about the same results as sources of nitrogen, there was a preference for the latter in certain cases. There was very little evidence of a preference for the urea, and it is concluded that the ammonium sulfate is therefore the more reliable and desirable.

Usefulness of ammonium bicarbonate as a fertilizer salt [trans. title], W. Gluud (*Gas u. Wasserfach, 67 (1924), No. 10, pp. 125, 126*).—Experiments

at five German experiment stations on the value of ammonium bicarbonate as a fertilizer demonstrated the practical value of this material, especially when mixed with the soil. It did not give as good results as ammonium sulfate as a top-dressing, however, presumably owing to its relatively greater volatility. The use of a covering of dry peat litter was found practically to prevent evaporation losses during storage.

Agricultural investigations, with special reference to the influence of phosphates on crops and pasturage at Roseworthy Agricultural College, W. J. COLEBATCH and R. C. SCOTT (*Jour. Dept. Agr. So. Aust., 28 (1924), No. 4, pp. 315–331*).—Reversion experiments with superphosphate are reported which showed that up to a limit of 100 lbs. per acre of superphosphate the maximum applications required to produce maximum economic crops of wheat should be applied at the time of seeding, irrespective of any quantities that may have been applied 12 months earlier. It was found that superphosphate applied several months ahead of seeding is not lost but undergoes reversion into less soluble forms, which are unfitted to promote rapid development of the root system in the early stages of growth.

Fertilizer experiments with superphosphate in bare fallow-wheat and in bare fallow-wheat-pasture rotations showed that under the two-course rotation up to 200 lbs. per acre of superphosphate could be applied with profit to either hay or grain crops. For wheat crops grown in a three-course rotation with pasture and fallow, it was found that for the crop alone the limits of profitable fertilization were 125 lbs. for grain and 150 lbs. for hay. For rotational grazing, without reference to crop yields, up to 200 lbs. could be used economically, and it appeared probable that an additional 25 lbs., or possibly even 50 lbs., would be profitable. An application of 200 lbs. per acre was found to yield the highest net return per acre, irrespective of whether the crop was cut for hay or harvested for grain.

Fertilizer experiments with basic slag under similar conditions showed that the slag had a very beneficial effect on wheat, the increase in hay or grain being amply sufficient to pay for the fertilizer and leave a good profit. The results as a whole are taken to indicate that while superphosphate is relatively more efficient in dry seasons, basic slag is more so in wet seasons. It is stated that in a general way basic slag is about three times as effective for grain crops and about 1.5 times as effective for hay crops in wet as in dry years.

Pot experiments with new phosphoric acid fertilizers [trans. title], O. DAFERT and R. LEOPOLD (*Ztschr. Landw. Versuchsw. Deut. Österr., 26 (1923), pp. 90–100*).—Experiments to compare tetraphosphate, raw rock phosphate, and Rhenania and so-called Reform phosphates with superphosphate and Thomas meal are reported. The soil used was sandy loam and the crop oats.

The rock phosphate and the Rhenania and Reform phosphates had a marked fertilizing effect, the best results being given by the first. The tetraphosphate, however, gave rather poor results. On account of the relatively low reaction of the soil to phosphoric acid additions, doubling the applications did not pay. There was a strong utilization of soil phosphoric acid where heavy applications of lime nitrogen were made.

The use of standard soils with the potassium thiocyanate test for estimating lime requirement of soils, A. F. GUSTAFSON (*Jour. Amer. Soc. Agron., 16 (1924), No. 12, pp. 772–776*).—In a brief contribution from Cornell University the advantages of using standard soils instead of a color chart for estimating the quantity of lime needed per acre by red clover, alfalfa, or sweet clover are briefly outlined. The use of standard soils is said to have the distinct ad-

vantage that the lime requirements of soils for clover can be estimated at any time after settling has occurred during a period of 24 hours.

Influence of fertilization with calcium chloride on Brassica nigra L. [trans. title], O. DAFERT and F. CHISAI (*Ztschr. Landw. Versuchsw. Deut. Österr., 26 (1923), pp. 77–85*).—In these studies calcium chloride when used as a fertilizer on black mustard had a toxic action. In small additions it interfered markedly with germination, and in larger additions prevented germination entirely and depressed plant growth and yield. However, certain applications under certain conditions not only did no harm but caused an appreciable increase in yield.

Filter-press cake as cane fertilizer, F. LÓPEZ DOMÍNGUEZ (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1924, p. 74; also in Spanish ed., p. 83*).—Data from experiments begun in 1922 on the use of filter-press cake as a cane fertilizer (E. S. R., 51, p. 819) are briefly reported, indicating increases in yield from the use of this material, which are apparently not much greater for the large than for the medium applications.

Influence of sawdust on crop growth in soils [trans. title], H. G. SÖDERBAUM and C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 271 (1924), pp. 22, figs. 3*).—Studies on the inhibitory action exerted by sawdust on plant growth in soils are reported. These included nitrification experiments in soil containing sawdust, and pot experiments with oats in sandy soil to which a mixture of sawdust and soil had been added.

The nitrification experiments showed that the presence of 2 per cent of sawdust in a soil, which otherwise had a normal power of nitrification, was enough to stop this process completely. The inhibitory action lasted more than a year. Further experiments indicated that this action was due to denitrification, and not to the presence of any substances in the woody material, such as resins or volatile oils, which might have a toxic effect on the nitrifying bacteria.

Trials with cellulose in the form of cotton gave exactly the same results as sawdust. This is taken to indicate that the inhibitory action was connected with the fermentation of cellulose, and the conclusion is drawn that the denitrification was due entirely to the fermentation of the cellulose.

The pot experiments showed a strong inhibitory action of the sawdust on the development of the plants to which no nitrogen was added. The inhibiting action was also evident in pots which received a moderate addition of nitrates, but it was less prominent. It is concluded that the inhibition of plant growth was due to a lack of nitrates resulting from denitrification. As soon as nitrification commenced in the sawdust-soil mixture, after the total decomposition of the cellulose had taken place, the inhibitory effect on plant growth disappeared. This action was also easily neutralized by adding a sufficient amount of nitrogen fertilizer to the soil.

Commercial fertilizers, J. J. BROWN (*Ga. Dept. Agr. [Quart.] Bul. 97 (1924), pp. 145*).—This bulletin contains the text of the Georgia fertilizer inspection law and revised rulings interpreting it, together with guaranties and the results of actual analyses and commercial valuations of 5,900 samples of fertilizers and fertilizer materials collected for inspection in the State during the period from October 1, 1923, to September 30, 1924, inclusive. The analyses show that of the total number of samples analyzed 54.51 per cent met their guaranty in every particular, 32.85 per cent failed in part but contained the total amount of plant nutrient material guaranteed by the manufacturer, and 12.64 per cent failed in that they were either 3 per cent below the total guaranty in commercial value or were more than 10 per cent off in one or more ingredients.

Commercial fertilizers for 1925 (*Md. Univ. Quart., No. 110 (1925), pp. 28*).—Information on the composition of various brands of fertilizer to be offered for sale in Maryland during the year 1925 is presented in this bulletin. A list of high-analysis fertilizers selected by the Maryland Experiment Station is included.

Fertilizer production, consumption, and trade in various foreign countries, H. A. CURTIS (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 305 (1925), pp. II+40*).—A brief review is presented of the fertilizer situation in various countries of the world other than the United States.

AGRICULTURAL BOTANY

Standardized plant names, F. L. OLMSTED, F. V. COVILLE, and H. P. KELSEY (*Salem, Mass.: Amer. Joint Com. Hort. Nomencl., 1923, pp. XVI+546*).—This is a catalogue of approved scientific and common names of plants in American commerce, prepared by the subcommittee, as above named, of the American Joint Committee on Horticultural Nomenclature, which was originally formed in 1915 by committees of the American Association of Nurserymen and of the Ornamental Growers' Association.

The catalogue includes both the scientific and common names, approved and synonymous, of plants in American commerce, very fully cross indexed and arranged in alphabetical sequence. The main list is followed by a statement of the American Pomological Society's committee on fruit variety nomenclature, systematizing the names of the more important and widely grown varieties of fruits and nuts.

The history of the compilation of the "Index Kewensis," B. D. JACKSON (*Jour. Roy. Hort. Soc., 49 (1924), No. 2, pp. 224–229*).—The early history of the Index Kewensis, and of the early supplements, is given, with mention of promoters and helpers, and with a short bibliography.

"Index Kewensis" (*Jour. Roy. Hort. Soc., 49 (1924), No. 2, pp. 222, 223*).—The character, purposes, and uses of the Kew Index are briefly outlined, with emphasis on the fact that this work is simply an index, and that it should be taken as such only, and not as an authority in itself upon any matter.

Studies in the physiology of the fungi.—XVI, Some aspects of nitrogen metabolism in fungi, L. J. KLOTZ (*Ann. Missouri Bot. Gard., 10 (1923), No. 4, pp. 299–368, figs. 23*).—This contribution reports, as part of the general series previously noted (E. S. R., 49, p. 125), an investigation on nitrogen metabolism in fungi, presenting also a discussion of work done or planned with bacteria and with yeasts. Other important contributions regarding nitrogen metabolism are reviewed or indicated.

The fungi used were *Aspergillus niger*, *Sphaeropsis malorum*, and *Diplodia natalensis*. Work was begun with *Phoma betae*, which was found by Duggar and Davis to fix free nitrogen (E. S. R., 37, p. 129).

Three methods of inoculation are outlined. Various methods for determining reducing sugars were tried.

Autolysis is indicated at first by decrease in dry weight of the fungus mat from a maximum and by the formation of ammonia in the peptone and KNO_3 media; later, by increase in total nitrogen of the culture solution from a minimum in all the media, and by the appearance of a trace of amino nitrogen in the three inorganic nitrogenous media. Autolysis in a given species is proportional to the rate and amount of growth attained. Ammonia, the chief nitrogenous product of autolysis, is a waste product of the splitting of the peptone of the media in the absence of another carbon source. In the presence of dextrose NH_3 was reassimilated. Disappearance of carbohydrate from the cul-

ture medium was synchronous with the beginning of autolysis. Amino nitrogen was readily assimilated by the fungi. Factors influencing the nitrogen content of the fungus mat are the nitrogen and carbon sources of the medium, incubation period, growth rate, and hydrion concentration.

The organisms showed markedly different physiological relations by their rates of growth and of sugar consumption, by their utilization and excretion of the several nitrogen forms, and by the varying nature and extent of H-ion change in the medium.

Influence of glucose and fructose on growth of fungi, J. M. Brannon (*Bot. Gaz., 76 (1923), No. 3, pp. 257–273*).—From experimental data obtained in a continuance of work previously noted (E. S. R., 51, p. 224), and from a survey of related contributions, the author concludes that the several organisms studied utilize glucose and fructose somewhat similarly, though the latter appears more favorable for the use of Aspergillus and Penicillium.

Studies on Bacterium radicicola [trans. title], W. Bialosuknia and C. Klott (*Rocz. Nauk Rolnicz., 9 (1923), No. 2, pp. 288–335, figs. 6*).—In the presence of nitrogen salts the effects of inoculating legumes with *B. radicicola* are generally slight, practically zero in case of sodium nitrite and sodium nitrate, though more considerable in case of ammonium sulfate. The formation of nodules on the rootlets does not in itself assure a good yield, the degree of activity of the bacteria varying according to the host species. Aptitudes or inaptitudes, as regards transmissibility between legumes, of nodule bacteria are indicated in some detail, with discussion of other characters.

The presence of a bacteriophage in root nodules of Leguminosae [trans. title], F. C. Gerretsen, A. Gryns, J. Sack, and N. L. Söhngen (*Centbl. Bakt. [etc.], 2. Abt., 60 (1923), No. 14–17, pp. 311–316, pl. 1*).—An explanation of the disappearance of legume root nodule bacteria is possibly afforded by the finding of a bacteriophage in the sense in which that term was used by d'Herelle (E. S. R., 48, p. 675). These organisms are said to be very specific as regards their action, which is generally restricted to the bacteria which associate with the corresponding nodules. They were obtained from the roots and stems of the plants but not from the leaves; from garden and field soils but not from heath or forest soils. The supposed organisms, according to their origin, withstand for 15 minutes temperatures of from 60 to 65° C. (140 to 149° F.), also a considerable degree of drying, and are said to pass through thin collodion membranes. The resistance of the bacteriophage to ultraviolet light is at least eight times as great as that of the bacterium with which it associates.

Growth of pollen tubes in self-pollinated apple flowers, I. Namikawa (*Bot. Gaz., 76 (1923), No. 3, pp. 302–310, figs. 9*).—A preliminary report of histological studies on certain phases of the problem of self-sterility.

Xerophytism and comparative leaf anatomy in relation to transpiring power, R. J. Pool (*Bot. Gaz., 76 (1923), No. 3, pp. 221–240, pls. 4*).—In tests regarding a means of correlating reliably transpiring power and habitat differentiation, employing essentially the method previously indicated (E. S. R., 49, p. 28), the author found the degree of correlation between habitat xerophytism and leaf anatomy and transpiring power as recorded by this method to be rather low and uncertain, showing moreover some puzzling features associated with the relations between leaf anatomy and the index of foliar transpiring power. Discrepancies, differences, irregularities, hypotheses, and suggestions are indicated.

Further experiments on growth of excised root tips under sterile conditions, W. J. Robbins and W. E. Maneval (*Bot. Gaz., 76 (1923), No. 3, pp.*

274–287, figs. 3).—The present paper is the record of further experiments, using the same methods as those reported earlier (E. S. R., 49, p. 627), on the growth of isolated root tips, employing maize, bean, morning-glory, white lupine, radish, alfalfa, mustard, wheat, sunflower, flax, water cress, buckwheat, and squash.

In 24 days sterile excised cornroot tips in Pfeffer solution, if kept in darkness, gain more as regards length and secondary roots in 4 per cent dextrose than if 0.2, 0.5, 1, 2, or 6 per cent dextrose is present. When the root tip tissue of excised roots is transferred at intervals of two weeks, the gain in the dark during the third period is about the same in Pfeffer solution containing 2 to 4 or 6 per cent dextrose. Excised roots of 0.35 cm. show as great increase in growth and secondary roots as do plants originally 6 cm. in length. Extracts of corn grains, seedlings, or endosperm, Canada field peas, clover, and Metagen favored growth of excised corn tips to no considerable extent.

In sterile Pfeffer solution without dextrose excised cornroot tips remain for 12 days capable of growth at room temperature in the dark. Excised tips from corn grown from grains near the middle of the ear outgrow those from tip or butt. Excised root tips of bean, morning-glory, alfalfa, mustard, wheat, sunflower, and flax made considerable growth in Pfeffer solution plus 2 per cent dextrose, results with radish, water cress, squash, and buckwheat being inconclusive. The root tips of white lupine could not usually be grown in Pfeffer solution containing various organic materials.

An histological study of regenerative phenomena in plants, C. M. Beals (*Ann. Missouri Bot. Gard., 10 (1923), No. 4, pp. 369–384, pls. 4*).—Reporting a study applied to several plants, the author states that regeneration occurs in the flax stem from the division of the epidermal cells, in Bryophyllum leaf at the notches from the division of the phloem cells of the veins, and in sweet potato, horse-radish, and parsnip from the division of the cambium cells.

In general, regeneration occurs from cambium cells when they are abundantly present and fully developed, as in the horse-radish, sweet potato, and parsnip; from the young epidermal cells of seedlings before the central cylinder has a well developed cambium, as in the flax seedlings; and from the small and actively divided cells of the phloem, as from the veins of the leaves of Bryophyllum.

Chemical changes at beginning and ending of rest period in apple and peach, O. Abbott (*Bot. Gaz., 76 (1923), No. 2, pp. 167–184, figs. 7*).—Results, with discussion, of this investigation suggest that fundamentally the rest period problem should be attacked from the same point of view as are problems in nutrition. The rest period and its inception and termination are associated with changing relations in H-ion concentrations, carbohydrate content, and the relative content of certain inorganic salts, particularly sulfates and phosphates, though within certain limits these relationships can be altered by various cultural treatments. The results suggest points of departure for the solution of certain problems, indicated.

Reaction of protoplasm to salts and antagonistic action of salts and alcohol, W. Seifriz (*Bot. Gaz., 76 (1923), No. 4, pp. 389–402*).—In work employing Elodea, as formerly (E. S. R., 51, p. 521; 52, p. 215), it was found that sodium chloride usually prevents ethyl alcohol from exercising its toxic influence on Elodea leaf cells. Calcium chloride does not antagonoze ethyl alcohol. Sodium chloride and calcium chloride in combination always prevent ethyl alcohol from causing death in the Elodea cell.

Is gaseous nitrogen a product of seedling metabolism? J. Davidson (*Bot. Gaz., 76 (1923), No. 1, pp. 95–101*).—To ascertain whether or not nitrogen is lost to the air in metabolism during the early life of plants, beginning with

germination, wheat and cowpea seedlings were grown under sterile and under nonsterile conditions. The results indicated that no nitrogen in gaseous form is necessarily lost due to metabolism during germination and early development of the seedlings.

Photochemical production of formaldehyde, E. C. C. Baly, I. M. Heilbron, and W. F. Barker (*Nature [London], 112 (1923), No. 2809, p. 323*).—These authors reply to statements by Spoehr (E. S. R., 53, p. 26), suggesting that the straight form of quartz mercury vapor lamp used by him may have undergone deterioration as to the power to give off short waves. This is something to which that form is said to be subject, and may explain his failure to secure confirmation of the results previously reported by them.

Recent publications on the formation of anthocyanic pigments [trans. title], R. Combes (*Bul. Soc. Bot. France, 70 (1923), No. 3-4, pp. 222-232, 263-276*).—Chiefly this is a critical review of work by others on anthocyanic pigments, the author's own findings and views, both earlier (E. S. R., 28, p. 30; 32, p. 824) and later (E. S. R., 50, pp. 224, 427), being also discussed.

Hydrogen-ion concentration in relation to animal and plant growth, H. Leffmann (*Jour. Franklin Inst., 197 (1924), No. 6, pp. 741-756, figs. 5; also in Amer. Jour. Pharm., 96 (1924), No. 7, pp. 509-524, figs. 5*).—This is chiefly a review of former views and practices in matters connected with acidity and plant growth.

Hydrogen ion concentration in relation to ecological factors, H. Kurz (*Bot. Gaz., 76 (1923), No. 1, pp. 1-29, figs. 14*).—Soils chosen as representative from a vegetational viewpoint were studied. It is reported that a range from high acidity to alkalinity was noted within a depth range of 3 ft. from the surface, most spring flowers showing no preference. Heavy rainfall, drought, freezing, and thawing caused no important fluctuations in H-ion concentration, which does not appear to be the main factor in the distribution of the species considered. Acid clays or silts and acid sands were characterized by two decidedly different plant associations. Again, certain sands, whether alkaline or acid, showed in common many ordinary plants which are not found in acid or alkaline silty or clayey soils.

Plum investigations.—I, Winter injury to plum during dormancy, M. J. Dorsey and P. D. Strausbaugh (*Bot. Gaz., 76 (1923), No. 2, pp. 113-143, pls. 2*).—A detailed study of winter injury to plum having been undertaken in order to devise a method of classifying hybrids and parents grown without protection on the basis of the maximum injury to the tenderest tissues, the present paper presents in some detail the points of injury in the plum.

The fruit bud is considered to be the dormant winter bud formed in late summer or early fall, as distinguished from the (1 to 5) flower buds inclosed by the scales of the fruit bud. In the inner scales of the fruit bud a complete transitional series can be found between scales and leaves on the one hand and scales and bracts on the other. The structure on which the flower buds are borne in the plum may be regarded as a foreshortened peduncle and therefore as constituting one extreme of a series with *Prunus pennsylvanica* and *P. virginiana*. The central part of the peduncle, called the pith core, is a very sensitive index to hardiness. The pith core is essentially a storage region, principally for protein substances, fats, and dextrin, starch not being found in these cells at any stage of the bud development. The pH value of the pith core cells is approximately 4.6. Calcium, magnesium, potassium, iron, and phosphorus were found.

Four distinct classes as to hardiness in the fruit buds are indicated, as are the different forms of behavior in connection with cold. The rate of thawing may be an important factor in killing as well as the rate of freezing. Killing in

the flower buds occurred near midwinter each year at a time corresponding closely to the break in the rest period. When the fruit bud is frozen, ice forms between the fruit bud scales, but not within the space about the flower buds. In winterkilled flower buds the nuclear organization of the cells is broken down, but the cell walls show no signs of rupture or breaking apart. In the bark where injury is slight the browning is confined to cortical cells containing chlorophyll. No starch was found in the bark, but the ray cells are packed with fat, and fat-containing cells are scattered throughout the cortical tissue. Browning in the wood is due, at least in part, to a condensation of storage materials, which apparently are transformed into gums and tannins. In browned wood the vessels are partially occluded by yellowish brown masses, the occlusions being most pronounced in the older vessels of the wood, forming the characteristic, concentric appearance of transverse sections of injured limbs.

Malformation of pine plantlet root systems due to improper planting [trans. title], E. WIBECK (*Meddel. Statens Skogsförsöksanst. [Sweden], No. 20 (1923), pp. 261–303, figs. 8*).—Types are shown, with discussion, of root growth abnormality occurring in young pines improperly planted.

GENETICS

Heredity and chromosomes, T. J. STOMPS, trans. by P. VON DALL' ARMI (*Erblichkeit und Chromosomen. Jena: Gustav Fischer, 1923, pp. VIII+158, figs. 24*).—This deals with the part which chromosomes play as carriers of the determiners of characters and in the determination of sex in plants and animals.

The chromosomes of a triploid Oenothera hybrid, R. R. GATES (*Ann. Bot. [London], 37 (1923), No. 148, pp. 565–569, pl. 1*).—"This paper deals with the distribution of the chromosomes in the microspore meiosis of a triploid hybrid, *O. rubricalyx*×*gigas*. It confirms earlier results with similar triploid hybrids, and further explains how the variety of chromosome numbers found in the second generation of such hybrids arises.

"In the heterotypic mitosis the chromosome distribution is usually 10–11, but from 1 to 6 chromosomes may be left out of the daughter nuclei. This is shown by the chromosome numbers on the homotypic spindles, which may be 11, 10, 9, 8, or 7, and usually differ in the two homotypic spindles of a cell. Cases occur where these two spindles have 10+11, 9+10, or 8+7. All the chromosomes regularly split and separate on the homotypic spindles, but certain split chromosomes frequently lag behind and are left out of the daughter nuclei, as on the heterotypic spindle.

"Thus pollen grains will be formed having every chromosome number between 11 or 12 and 7. As pairs of tetrad nuclei usually have the same chromosome number, aberrant forms should be looked for in pairs in the next generation."

The origin of species by large, rather than by gradual, change, and by Guppy's method of differentiation, J. C. WILLIS (*Ann. Bot. [London], 37 (1923), No. 148, pp. 605–628*).—This paper presents arguments in favor of the origin of species by large mutations, rather than by the gradual accumulation of small variations (whether infinitesimal or mutational) which is assumed by the Darwinian theory. Some compromise between the two extreme suppositions of special creation and of natural selection is needful, and it is suggested that the best is the evolution of species by large differences suddenly appearing.

A brief account is given of former investigations of the endemic species of Ritigala, and it is claimed that the chief distinguishing characters of *Coleus*

elongatus do not allow intermediate forms and that they can not be the subject of natural selection. The explanation is that they were formed by large changes. The same is claimed to be the case for a vast proportion of important distinguishing characters between species generally. H. B. Guppy's differentiation theory, which is upon much the same lines, is also touched upon. Other published work is described in brief, all pointing to the same general conclusion, and it is claimed that the destruction of intermediates will not explain the facts, nor that there is any reason for it, in the majority of cases.

Instances are given of characters in some cases having great importance as family diagnostics and in other cases only generic or specific; and the characters of the abnormal members of the Rubiaceae are given in full detail for the purpose of showing that in a single large family no character whatever is *necessarily constant throughout*. The incidence of rumination of endosperm, sometimes a generic or even only a specific character, is described in more detail. Finally, evidence in favor of large mutations given by the work of the author and another is touched upon. If genera follow in their evolution the rules of compound interest, then it is practically impossible to suppose them formed in any other way than by sudden mutations. All the evidence produced in this paper is considered to point to the same conclusion.

The trisomic mutations of Oenothera, R. R. Gates (*Ann. Bot.* [*London*], *37* (*1923*), *No. 148, pp. 543–563, pl. 1*).—This paper records the occurrence, in the F_1 of *O. rubricalyx*×*O. hewettii*, of two mutants having 15 chromosomes, but of a type different from *O. lata* and having viable pollen. Supposedly, it most nearly resembles some of the *semilata* mutations. The occurrence of a pair in such cases is regarded as significant and as indicating that nondisjunction of a pair of chromosomes in the heterotypic division of a pollen mother cell of the male parent led to the formation of two pollen grains having eight chromosomes, both of which afterwards functioned in fertilizing eggs. In diakinesis in the pollen mother cells of this mutation as many as five ring pairs of chromosomes are found. Some of the chromosome rings persist on the heterotypic spindle even until metaphase. These statements are followed by a discussion of all the trisomic forms of Oenothera (having 15 or 16 chromosomes). The origin of mutations with 14 chromosomes such as *nanella*, it is said, could be accounted for by the double nondisjunction as well as through crossing-over, but neither theory explains the later genetic behavior of these forms.

"The evidence now indicates that forms with aberrant chromosome numbers make up the great majority of Oenothera mutations. There is an older group of 15-chromosome mutants from *O. lamarckiana* which includes *lata*, *scintillans*, *albida*, *oblonga*, *suborata*, and probably several others. More recently a series of others more like *O. lamarckiana* has been recognized, including *cana*, *pallescens*, *lactuca*, and *liquida*. Apparently *lata*×*lamarckiana* can give rise to any of these.

"Trisomic mutants appear much more frequently in the offspring of *lata* than in the offspring of *lamarckiana*. Again, several at least of the simple trisomic mutants are interchangeable. Thus *lata* gives rise to *scintillans* and *scintillans* to *lata*. The view is developed that this results from secondary irregular chromosome distributions.

"This leads to the question how far the chromosomes of Oenothera may be differentiated from each other. The conclusion is reached that the degree of differentiation probably varies in different organisms, being generally greater in animals than in plants. Such differentiation may be increased by the occurrence of Mendelian mutations, but in Oenothera mutations of this type are relatively infrequent."

False cleistogamy, floral polymorphism, and central proliferation of the ovary in Cardamine pratensis [trans. title], L. BLARINGHEM (*Rev. Path. Vég. et Ent. Agr., 10 (1923), No. 2, pp. 141–150, fig. 1*).—Anomalous and transitional plants of *C. pratensis*, as regards chiefly floral developments, are noted in connection with temperature and other conditions, some of the facts suggesting the occurrence, in one instance at least, of genuine mutation.

Floral biology of the potato [trans. title], K. O. MÜLLER (*Angew. Bot., 5 (1923), No. 3, pp. 146–153*).—A large number of pollination studies carried out during 1922 and 1923 showed self-fertilization to be normal to potato, insect pollination to rank second, and wind pollination a low third in order of frequency. The supposed genetic significance of certain facts noted is discussed.

The attainment of homozygosity in inbred strains of maize, D. F. JONES (*Genetics, 9 (1924), No. 5, pp. 405–418, figs. 7*).—Four strains of maize, self-fertilized 8 generations or more, were each separated into two paired lines, which were further self-fertilized for 8 or 9 additional generations at the Connecticut State Experiment Station. At the end of this period the paired lines of two strains did not differ visibly, one strain differed only in seed color, and the fourth differed noticeably in many characters.

When the paired lines were crossed and the hybrids compared with their parents, significant increases were seen in some characters in the strains visibly alike. Hybrids of the paired lines differing in many respects were significantly increased in all characters. A test showed two strains self-fertilized for 14 and 15 generations, respectively, to be apparently homozygous. Two germinal changes have occurred in these long inbred strains in such a way that they could not be due to outcrossing and were probably not due to delayed segregation.

Self-fertilizing plants produced by the crossing of two long inbred strains in 7 successive generations again caused a reduction in size and rapidity of growth and an increase in uniformity. This proceeded at about the same rate as when the plants were first inbred, until about the same level of vigor was established, when the reduction practically ceased.

The inheritance of grain color in wheat, H. K. HAYES and D. W. ROBERTSON (*Jour. Amer. Soc. Agron., 16 (1924), No. 12, pp. 787–790*).—Segregation for grain color in the F_2 of reciprocal crosses between Marquis and Bobs wheat at the Minnesota Experiment Station indicated that red color in Marquis wheat is the result of two independently inherited factors, either of which alone leads to the production of red color. Kanred and Minturki wheats used in crosses with Marquis at the Colorado Experiment Station appeared to have a third factor for red grain color, independent in inheritance of the factors for grain color found in Marquis.

Inherited deficiency in carbohydrate metabolism in maize, W. H. EYSTER (*Bot. Gaz., 78 (1924), No. 4, pp. 446–452, figs. 3*).—Inherited chlorotic types of maize, partially or wholly deficient in one or more of the chloroplastid pigments, seem to be of common occurrence. When the first source of carbohydrates for maize seedlings, the endosperm, is exhausted, the plant dies unless it can synthesize additional carbohydrates sufficient to maintain life. In genetic investigations at the Missouri Experiment Station a type of maize has been found that digests and absorbs the endosperm, but is unable to utilize the sugars thus obtained in the vital processes. This deficiency in carbohydrate metabolism, termed "glucostacty," was found to be inherited as a simple Mendelian recessive character.

Inheritance of black and red coat colors in cattle, M. H. CAMPBELL (*Genetics, 9 (1924), No. 5, pp. 419–441*).—The results of a study of the inheri-

tance of black and red coat colors in cattle which has been conducted on the Bowlker herd are reported from the Illinois Experiment Station. This herd consists of offspring of Holstein-Guernsey crossbreds.

From these results it is indicated that the black of Holsteins is dominant to the red of Guernseys. Red and white × red and white matings always gave red and white offspring, and the black and white F_1s mated with red and white gave black and white and red and white offspring in approximately equal numbers, while crosses of heterozygotes produced black and white and red and white in a 3:1 ratio. Some red and white animals have resulted from the matings of purebred Holsteins with red and white animals, indicating that these purebreds were heterozygous for black, as has also been found by other investigators. Some variation in the intensity of both red and black colors was also observed.

Aberrant forms in Arctic sweet clover, L. E. Kirk (*Sci. Agr., 5 (1924), No. 4, pp. 113–116, figs. 6*).—Ten very distinct forms discovered in an increase field of Arctic sweet clover at the University of Saskatchewan in 1924, and described and illustrated in this article, seem to be natural hybrids. While they have little resemblance to alfalfa, they approach it in certain characters, such as the branching crown, numerous stems, elongated slightly coiled pods, foliage, and constricted flower clusters. It is held significant that the Arctic sweet clover in 1921 was grown in an isolated, long, narrow field adjacent and parallel to a field of Grimm alfalfa.

A hybrid between Asiatic and American cottons—Gossypium herbaceum L. and G. hirsutum L. [trans. title], G. S. Zaĭtsev (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 2, pp. 117–134*).—By completely exposing the pistil through removing the whole corolla together with the stamen tube, a hybrid was obtained between *G. herbaceum* and *G. hirsutum laciniata*. In most of its characters the hybrid plant was intermediate between its parents, although it had the appearance of male dominance and showed heterosis strikingly. The hybrid was reciprocally sterile with the parent forms and with other species of Gossypium.

Resistance to parasitic fungi in a spelt-rye hybrid [trans. title], L. Blaringhem (*Bul. Soc. Path. Vég. France, 9 (1922), No. 4, pp. 267–276, figs. 2*).—The spelt-rye hybrid previously referred to (E. S. R., 52, p. 628) showed certain characters in marked degree, particularly growth anomalies which are described, also resistance to *Puccinia graminis* and to *P. glumarum*. The behavior of *Claviceps purpurea* in connection with this hybrid is also indicated.

Linkage of albino allelomorphs in rats and mice, H. W. Feldman (*Genetics, 9 (1924), No. 5, pp. 487–492, fig. 1*).—The results of an experiment, begun at the University of Illinois and finished at the Bussey Institution, in studying the linkage relations of albino allelomorphs in rats and mice are reported. In these experiments, pink-eyed colored animals, *CCpp*, were mated with ruby-eyed dilute individuals, c^rc^rPP, and the heterozygotes mated to the double recessives. In the mice an additional cross was made of ruby-eyed dilute, c^rc^rPP, with albinos carrying the pink-eye factor, *ccpp*. The F_1s thus produced were also mated with the homozygous double recessives for a determination of the crossover percentages, which were based on the difference between the numbers of the dark-eyed individuals and the other types produced. The crossover percentages obtained in these experiments were between ruby-eye and pink-eye, in the rat 17.18±0.62 per cent and in the mouse 17.42±1.14 per cent. These results agree very well with those reported by Castle and Wachter (E. S. R., 52, p. 128) for albinism and pink-eye, and thus "warrant the conclusion, therefore, that the ruby-eye allelomorph of albinism

has the same linkage strength with pink-eye that albinism has in both the rat and mouse."

Crossing-over in females seems to be slightly more frequent than in males. Tabulations of the crossing-over occurring in the offspring of individuals showed that they followed a normal frequency distribution, and no genetic factors were indicated as influencing the linkage.

The determination of secondary sex characters in fowls [trans. title], A. PÉZARD (*Rev. Gén. Sci., 35 (1924), No. 24, pp. 693–703, figs. 7*).—A more complete discussion of this problem with reference to the experiments noted below and others.

Modifications by sexual hormones in adult fowls and the theory of specificity of form [trans. title], PÉZARD, SAND, and CARIDROIT (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 24, pp. 2011–2013, figs. 2*).—By the removal of the ovaries from adult hens or the testicles from adult cocks, the changes in the secondary sex characters resulting resembled those produced by removing the gonads from young fowls. By transplanting sexual organs in gonadectomized birds, the secondary sex characters associated with the organs transplanted were simulated. In the case of a male receiving ovarian transplants and a female receiving testicular transplants, the comb resembled the male, while the feathering was female. The authors conclude from these studies that birds tend to be neutral in the manifestation of their secondary sex characters and may be modified by the presence of the gonads of either sex.

Seasonal differences in sex ratio, litter size, and birth weight of the albino rat under uniform laboratory conditions, F. B. HANSON and F. N. SHOLES (*Genetics, 9 (1924), No. 4, pp. 363–367*).—By grouping the rats born in five generations of inbreeding at the Washington University, St. Louis, according to 3-months periods, the effect of the season of birth on the sex ratio, litter size, and birth weight was determined. In all but one case, i. e., birth weight of spring and autumn litters, the probable error of the differences between the various constants was larger than or nearly as large as the difference. In the excepted instance, the difference was only twice the probable error.

It is thus indicated that season has had no significant influence on sex ratio, birth weight, or litter size.

FIELD CROPS

[Crop experiments in Indiana] (*Indiana Sta. Rpt. 1924, pp. 39, 40, 48, 49, 50, 51, fig. 1*).—Work on the experimental farms included variety tests with winter wheat, corn, oats, and alfalfa, and pasture studies. Milling and baking tests showed Michikoff winter wheat (E. S. R., 49, p. 830) to surpass common wheats grown in the same localities and to rank with hard winter and spring wheats in bread value. Purkoff, a soft wheat selected from the cross which produced Michikoff, showed ability to yield high on clay soils in southern Indiana.

[Field crops experiments at the Crookston, Minn., Substation, 1923], C. G. SELVIG and R. S. DUNHAM (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 11, 12, 18, 19, 19–42, 45, 46, 56, 57, 63, 64, 66–75, 80, 81, 96, 97, 98, figs. 5*).—Further experiments with field crops (E. S. R., 51, p. 133) comprised variety trials with spring and winter wheat, oats, barley, rye, corn, flax, alfalfa, sweet clover, soy beans, potatoes, sugar beets, mangels, rutabagas, and stock carrots; comparisons of hybrids of wheat, barley, and oats; trials of corn and soy beans in mixtures; seeding tests with wheat, oats, barley, winter rye, corn, flax, grain mixtures, alfalfa and soy beans; and rotations.

Wheat and flax in different mixtures did not yield in excess of either crop alone, although wheat in flax controlled weeds. The average yield of wheat in a 3-year rotation exceeded that in 5- and 7-year rotations. Continuous wheat, alone and with 6 lbs. of clover, declined in yield, due partly to wild oats in the plats. Oats yields in 5- and 7-year rotations continue in favor of the 7-year rotation. Rotating wheat, barley, and oats made no increase over continuous cropping nor were weeds controlled better.

No loss of weight occurred by cutting oats at the yellow-neck stage instead of at maturity except with Improved Ligowa and Gopher, but a loss averaging about 26 per cent was suffered by oats cut in the green-neck stage. The grain from the green stage in several wheat varieties weighed less than that from the dead-ripe stage, which in each sort except Kota exceeded the grain cut in the yellow-neck stage.

Sow thistle seeds seem to require a resting period and in the field do not germinate the year produced. Plowing under seeds to a depth of 7 in. does not kill them but greatly retards their growth so that fewer cultivations would be needed to prevent leaf formation. While infestations occur more generally from old roots, seedlings given favorable conditions may also produce heavy infestation. Buckwheat controlled sow thistle in an infested field better than other crops tested.

Scarifying increased the average germination of sweet clover seed from 51 per cent to 92 per cent and reduced the original percentage of hard seeds from 44 to 5. The seed broken by the process averaged 1.12 per cent. It appeared that lots of seed containing much unhulled seed could be scarified twice to advantage. Cutting tests demonstrated that sweet clover cut before bloom makes a much more palatable hay than when cut later. Frequent cuttings did not kill the plants.

Homemade Bordeaux mixture proved more economical than commercial brands in spraying potatoes. Potatoes sprayed 5 times with Bordeaux yielded 50.45 bu. per acre more and grew fully 10 days longer than plants on the check plats. Acid phosphate continued to be the most profitable commercial fertilizer for potatoes on the station soil. Sixteen tons of manure per acre applied in 8-ton amounts twice in the rotation produced the greatest yield of potatoes per ton of manure applied. Many desirable apparently disease-free strains appeared among the tuber unit selections of Early Ohio and Irish Cobbler potatoes.

[Field crops experiments at the Morris, Minn., Substation, 1923], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1923, pp. 24–42*).—Variety trials with spring and winter wheat, oats, barley, rye, corn, soy beans, field beans, alfalfa, and potatoes; seeding tests with winter wheat and rye; spraying and cultivation trials with potatoes; rotations; and production of certified seed are reported in continuation of earlier investigations (E. S. R., 51, p. 134).

[Field crops work at the Holly Springs, Miss., Branch Experiment Station], C. T. Ames (*Mississippi Sta. Bul. 223 (1924), pp. 5–23*).—Experiments (E. S. R., 50, p. 828) reported on included variety tests with cotton, corn, sweet potatoes, and alfalfa; spacing tests with cotton and sweet potatoes; fertilizer trials with cotton and corn; and interplanting of corn with soy beans and velvet beans. Suggestions are given for the production of the above crops, sorghum for silage, vetch, and lespedeza.

[Agronomic work in New Mexico] (*New Mexico Sta. Rpt. 1924, pp. 40–44, 46–50, fig. 1*).—Further investigations (E. S. R., 51, p. 433) comprised variety tests with fall and spring seeded wheat, oats, and barley, and corn, cotton (E. S. R., 51, p. 129), and alfalfa.

Chamiza (*Atriplex canescens*) seed held for over 6 years germinated a maximum of 22 per cent, between 2 and 3 years 20, between 1 and 2 years 7, and gathered less than 1 year 2 or 3 per cent. Seed germinated best when planted about 1 in. deep. Late fall and winter plantings will probably give the best germinations in southern New Mexico.

[Agronomic investigations at the Northern Great Plains Field Station, 1913–1922, inclusive], W. P. BAIRD, J. T. SARVIS, J. C. THYSELL, T. K. KILLAND, and J. C. BRINSMADE, JR. (*U. S. Dept. Agr. Bul. 1301 (1925), pp. 46–70, fig. 1*).—Important field crops were grown from 1915 to 1922, continuously, in various sequences, and receiving different cultural treatments, manure, and green manure. Results to date suggest that spring wheat can be grown most profitably on disked corn ground in a system of livestock and grain farming in the section. Summer fallow and spring wheat would be a better method with wheat growing alone if corn is not desired or will not thrive. Winter wheat has been grown successfully in limited areas by drilling into grain stubble. Oats fit well into a rotation with corn and wheat, wherein they would best be placed on spring plowing after spring wheat. Corn and potato ground also furnish good preparation for oats. Barley rotates well with corn and oats or corn and wheat. It averaged 24 bu. per acre on disked corn land, 24 on fall plowing after barley, and 30.6 bu. after summer fallow. Corn is valuable for grain and fodder and because corn ground affords one of the best preparations in this area for all small grain crops. Spring plowing is preferable for corn. With either spring or fall plowing the yields of corn following the different small grains do not differ much. The highest yields of corn stover were made following summer fallow and corn and after small grain on spring plowing. Where manure is applied for the corn crop the yield of both grain and stover, particularly stover, has been higher than in similar rotations unmanured. Methods under trial did not produce paying yields of flax. Alfalfa, brome grass, potatoes, sorgo, and green manure crops were also included in the rotations.

Notable among the cereal varieties were Kubanka No. 8, Marquis, and Kota wheat; Golden Rain, Victory, and Sixty-Day oats; White Smyrna and Hannchen barley; Dakota White, Gehu, and White Ree flint corn; and Northwestern, Payne White, Minnesota No. 13, and Rustler dent corns. The behavior and forage value of varieties of alfalfa, sweet clover, perennial grasses, millets, sorghums, and corn, and the silage merits of corn, sunflowers, and sorgo are also discussed.

Experiments with flax on breaking have been reported on earlier (E. S. R., 44, p. 36). The 3-year average acre yields of all flax varieties on breaking was 14.8 bu., while those on old land during 6 years made 4.1 bu. On a loose seed bed on old land slightly better yields may be expected from seeding 25 lbs. per acre than from less. Date of seeding experiments on old land indicated the advantage in dry seasons of thoroughly cultivating the land with a disk harrow before seeding in order to destroy weeds. Mixture of flax with Marquis spring wheat gave better results than the mixture of flax with oats or barley.

From 1913 to 1922, inclusive, Green Mountain potatoes averaged 185 bu. per acre, Irish Cobbler 163, and Rural New Yorker 144 bu. Home-grown seed showed a tendency to run out or degenerate. The 20-in. spacing has been the most desirable distance tested. Results to date from hill and tuber-unit selections have been largely negative, in that no higher yielding strains have been isolated.

[Field crops work in Oklahoma] (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 20, 21–26, 29, 30*).—In continued investigations (E. S. R., 49, p. 428) varietal leaders have included Oklahoma Triumph 44, Half-and-Half, Mebane, Burnett

and Acala cotton; Turkey, Kanred, and Blackhull hard wheats; Fulcaster, Sibley, Fultz, Miracle, and Mediterranean soft wheats; varieties of Red Rustproof oats; and Sumac and Orange sorgo. Breeding work was carried on with cotton, wheat, and barley; milling and baking tests with wheat (E. S. R., 48, p. 136); seeding trials with sweet clover; and cultivation tests with cotton, potatoes, and with kafir (E. S. R., 53, p. 81).

Cotton with tops mowed off rather low made 237 lbs. per acre, with squares removed during July 481, topped cotton 544, and untreated plats 693 lbs. Yield differences between unthinned cotton and cotton in spacings up to 24 in. apart have been slight.

Continuous wheat when manured has averaged 17.67 bu. during 30 years, as compared with 7.67 from unmanured wheat. On ordinary upland soil a rotation increased the average yield of oats 6.12 bu. per acre, kafir 4.91, and wheat 6.46 bu. Kafir in alternate rows or double rows with cowpeas yielded less than kafir planted in every row. The most fodder and highest grain yields were obtained from the thicker plantings of kafir.

[Field crops work at the Porto Rico Insular Station], R. MENÉNDEZ RAMOS, P. R. KUNTZ, A. H. ROSENFELD, and F. LÓPEZ DOMÍNGUEZ (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1924, pp. 19–22, 41, 42, 57–60, 62–68, 73, 74, 75, pls. 6, fig. 1; also in Spanish ed., pp. 20–23, 45–47, 48, 57–59, 69–76, 82 83–85, figs. 7*).—Investigations described in these pages include varietal, fertilizer, and improvement studies with sugar cane and varietal trials with sweet potatoes and forage grasses, and cowpeas, soy beans, and velvet beans for cover crops and green manure.

B. H. 10 (12), St. Croix 12 (4), D. 1135, and D. 216 were promising among the sugar cane varieties. Cowpeas and jack beans were recommended for cover and green manure. Napier grass seemed more drought resistant than Guatemala grass. Bonilla and Ramira were outstanding among sweet potato varieties, none of which proved resistant to sweet potato weevil (*Cylas formicarius* Fabr.).

[Field crops work on the Wyoming State Farms], W. L. QUAYLE (*Wyoming Sta. State Farms Bul. 4 (1923), pp. 1–13, figs. 3*).—A discussion is given of results from experiments reported on from the Archer (E. S. R., 48, p. 734) and Sheridan (E. S. R., 52, p. 527) Stations, and the Lander, Uinta County, and Goshen County Farms, comprising rotations including spring and winter wheat, oats, barley, and corn, grown on differently prepared seed beds; variety trials with these crops, and sorgo, millet, alfalfa, field peas, soy beans, cowpeas, and potatoes; and seeding tests with spring and winter wheat, Sudan grass, field peas alone and in combination with oats, and potatoes.

[Field crops experiments in the Philippine Islands], A. HERNANDEZ (*Philippine Bur. Agr. Ann. Rpt., 23 (1923), pp. 77–119, 129–134, pls. 4*).—The investigations reported in these pages continue those already noted (E. S. R., 50, p. 733).

Deep submergence of rice (15 to 20 cm.) was effective in controlling the common rice weeds such as *Eleocharis capitata* and *Cyperus difformis*, although it seemed to delay maturity somewhat. Eleven important rice weeds are described.

Preliminary histological studies made to account for the quality of wrapper leaves gave indications that the relatively well-developed cuticle of Sumatra tobacco is responsible for its ability to stand the stress to which it is subjected, whereas the central parenchymatous cells appear to be very weak, since they can not be well defined in the cured and fermented leaf. The native Dammao Medium Broadleaf has a relatively poor cuticle but a stronger central parenchyma.

[Field crops work in Tunis, 1921–1922], L. GUILLOCHON, J. V. AMIABLE and GÉRY (*Dir. Gén. Agr., Com. et Colon. [Tunis], Bul., 28 (1924), No. 116, pp. 44–51, 57–81, 82–85, 107–119, 121–141, pls. 3, fig. 1*).—Besides reporting the continuation of experiments with different field crops (E. S. R., 49, p. 31) these pages include articles on the composition of the wheats of Tunis, by F. Boeuf; the growth of cultivated plants (corn) in relation to environment, by A. Petit; and a study of the problem of soil heterogeneity in experimental fields, by J. V. Amiable.

Experiments with small grains on the Arlington Experiment Farm, J. W. TAYLOR (*U. S. Dept. Agr. Bul. 1309 (1925), pp. 28, pls. 4, figs. 10*).—Supplementing experimental data recorded earlier (E. S. R., 34, p. 733), variety tests with winter wheat, spelt, emmer, oats, rye, and barley, and spring wheat, and seeding trials with varieties of wheat are reported for the period 1910–1923, inclusive. The usual climatic and environmental data are included, and certain varieties are described.

The poorest yields of winter wheat occurred in those years when the total April, May, and June rainfall was heaviest. Spring seedings of wheat, oats, and barley have not resulted in satisfactory yields. Awnless winter wheats have produced the highest yields. Seeding winter wheat at the rate of 6 pk. per acre has returned the maximum average net yield. In 1922 lodged wheat set 73.9 per cent of seed and wheat not lodged 89.7 per cent, with respective weights per 1,000 kernels of 16.86 and 25.89 gm. Varieties have responded somewhat differently to several rates of seeding. Winter spelt produced more pounds of grain to the acre than either winter oats or winter barley, while winter emmer has yielded very poorly.

Varieties of winter cereals recommended for eastern Virginia and eastern and southern Maryland include Purplestraw, Potomac, Fultz, Poole, Shepherd, *Fulcaster, and Mammoth Red wheat, Alstroum spelt, Abruzzi and Von Rümker* No. 2 rye, Winter Turf and Culberson oats, and Wisconsin Winter, Orel, Han River, and Pider barley.

[Fiber crops investigations in Canada], R. J. HUTCHINSON (*Canada Expt. Farms, Div. Econ. Fibre Prod. Rpts. 1921–1922, pp. 11, fig. 1; 1923, pp. 23, figs. 2*).—Variety and seeding trials and scutching, retting, and spinning tests with flax; the relative value of different soil types for flax; experiments with new machinery; and cultural and varietal trials with hemp are reported on as heretofore (E. S. R., 48, p. 32).

Flax grown at Agassiz, B. C., and Kentville, N. S., produced the highest yields and best quality of fiber, resembling the best grades of Irish. In the Ottawa tests, delaying the harvest of flax resulted in more and stronger fiber. Broadcasted flax gave slightly higher yields, while drilled flax was a little shorter, more uniform, ripened earlier, and showed a greater tendency to lodge. Seeding late after a week of dry, warm weather gave the best results on heavy soil, and the fiber yield increased with seeding up to 110 lbs. per acre. Fiber obtained by the Kayser retting process was very green and harsh. Flax retted at over 68° F. appears to produce a greenish colored fiber with reduced strength and spinning value. In machine hackling a difference of 12.88 per cent in yield of line was in favor of water-retted fiber, but in the subsequent stages three-ply yarn and finished twine from dew-retted fiber had better tensile strength than those made from water-retted fiber. From dry flax straw in 1922 were obtained 8.2 per cent of long fiber and 4.46 of tow, and the losses in deseeding amounted to 34.43 per cent, in retting 16.23, and in breaking and scutching 36.68 per cent.

Preliminary trials with hemp at Ottawa showed the superiority of Kentucky seed, the unsuitability of heavy clay soil for hemp, and the necessity of good drainage.

[**Root crops experiments in Canada**], F. T. Shutt (*Canada Expt. Farms, Div. Chem. Interim Rpt., 1922, pp. 65–77; Rpt. 1923, pp. 15–24*).—Additional analyses (E. S. R., 48, p. 31) of sugar beets, mangels, turnips, and carrots are tabulated.

Alfalfa yields, cultural practices, and production costs as influenced by the soil formation in New Jersey, G. W. Musgrave and A. G. Waller (*New Jersey Stas. Bul. 408 (1925), pp. 31, figs. 11*).—The records of a survey to determine the cost of production of alfalfa in New Jersey were classified according to soil formation as follows: Soils of (1) limestone origin, residual, and glacial; (2) the Appalachian mountains and plateaus, residual and glacial, exclusive of poorly drained types; (3) the Piedmont Plain; and (4) the Coastal Plain. The topics discussed for the four soil groups include alfalfa acreages, acre yields and costs, land rental, frequency of cutting and age of stand, sources of seed, seeding practices, application of manure, lime, and fertilizer, the relation between these additions and rotations and alfalfa yields, and growers' difficulties in obtaining success with the crop.

Hard seed in alfalfa, L. W. Durrell (*Colorado Sta. Rpt. 1924, pp. 21, 22*).—Investigation by A. M. Lute has shown that the hard seed percentage for Colorado-grown alfalfa seed averages about 22 annually. Lots of seed from different localities and containing different percentages of hard seed, when planted at the same time in the same locality, produce similar percentages of hard seed at harvest. The percentage of hard seed found in machine-threshed seed from a field in different years varies greatly, but more is found in hand-threshed than in machine-threshed seed. Great variations are seen in hand-threshed seed from individual plants in the same field. Seed harvested when slightly immature has a lower germination and slightly more hard seed than mature seed. The percentage of germination and of hard seed for a given sample is constant within the accepted tolerance.

The rate of deterioration in germination due to old age is extremely variable. Hardness practically disappears from alfalfa seed after 11 years' storage, one-half or more changing after 3 years. Some of the hard seed germinates as early as the third storage year, and when stored under good conditions more than 70 per cent germinates when 3 years old.

The effect of dry heat on alfalfa seed and its adulterants, E. V. Staker (*Jour. Amer. Soc. Agron., 17 (1925), No. 1, pp. 32–40*).—The effect of dry heat on commercial alfalfa seed, on alfalfa seed of different colors, and on certain weed seeds, was studied at Utah Agricultural College. Subjecting commercial alfalfa seed to temperatures between 60 and 90° C. (140 to 194° F.) increased the percentage of germination, 60° seeming as effective as 90°. The higher germination of the heated seed as compared with unheated seed is due to the reduced number of hard seeds. As measured by increased germination, light green or yellow alfalfa seed is more responsive to heating than is brown seed. Much of the inferior seed of alfalfa, i. e., the shriveled green, dark green, shriveled brown, light brown, and the dark brown seed probably can be killed by dry heating at 85 or 90°.

Seeds of Russian thistle and white tumbleweed seemed to be completely killed at temperatures of 85 and 90° maintained for four hours, and seeds of sour dock and buckhorn plantain were seriously affected. Tumbling mustard resisted heat the most of any seed tested, and no temperature below 92° seriously impaired the germination of green foxtail. Dry heat, at least from

75 to 80°, seems to be especially beneficial to the germination of plantain. Although the results with dodder were rather inconclusive, the author believes it can be successfully controlled by heating alfalfa containing the seed at 80 to 90° for four hours.

Corn in the Red River Valley, R. S. DUNHAM (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 86–95*).—Cultural and field practices, varieties, and methods of seed selection suitable for corn production in the Red River Valley are suggested on the basis of experiments at the Crookston Substation and the experience of farmers.

Big-scale corn raising in Montana, H. E. SELBY (*Montana Sta. Bul. 171 (1925), pp. 4–46, figs. 14*).—Methods and practices involved in the extensive type of corn production of recent development in Montana are described from the results of farm surveys.

Although wheat yields on corn ground may not average as high as on summer fallow, many farmers can produce corn practically as cheaply as they can summer fallow their land, and the corn value more than offsets the difference in wheat yields. Listing is especially adapted to this type of corn growing, saving labor and time. It is not suited to the heavier soil types, however, and listed corn often does not mature as early as surface-planted corn. Pasturing off with cattle, hogs, and sheep is the most economical method of harvesting the Montana corn crop. The big-scale corn raiser probably will have to supplement pasturing off by cutting part of the corn and by picking part in good years. Because of the variable seasons and rainfall, he should not overstock his farm by anticipating even an average corn crop.

Flowering, fruit formation, and dehiscence of the bolls of the cotton plant [trans. title], G. S. ZAĬTSEV (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 2, pp. 391–460*).—Blooming and the formation and opening of bolls were studied in a number of varieties of cotton grown near Tashkent in Turkestan. The flowering succession and the process of dehiscence are detailed in an English summary.

The length of the period from blooming to dehiscence of bolls was observed to vary with the time from planting to blooming. Shading of the flower before, during, or after opening involved a depression in the development of the fruit, which showed itself in the reduced number and weight of seeds formed and in the reduced length of fiber. The rate of shedding of the bolls was less for earlier flowers than for late ones. The gradual increase of boll shedding, within the limits of the plant, is held to be closely related to the diminished nutrition of the remoter parts of the plant. This progressive shedding appears inevitable under any conditions of cultivation.

Under Turkestan conditions natural crossing averages about 5 per cent. Experiments with mixed pollination demonstrated clearly the superiority of the plant's own pollen in regard to rapid fertilization of the ovules. The more genetically distant forms are at a disadvantage in competition with the proper pollen of the particular flower. In the natural crossing observed the length of the style and stigma was of no essential importance, and a short style did not prevent natural crossing.

Fertilizer tests with cotton in north Mississippi, Holly Springs Branch Experiment Station, C. T. AMES (*Mississippi Sta. Circ. 55 (1924), pp. 4*).—A summary of the fertilizer experiments with cotton noted on page 131.

Cotton growing on the southwestern projects (*New Reclam. Era [U. S.], 16 (1925), No. 1, pp. 7–9, figs. 3*).—The methods in general use on the Salt River, Yuma, Carlsbad, and Rio Grande irrigation projects are outlined.

Cotton culture in the United States, L. Libró Ortiz (*El Cultivo del Algodonero en los Estados Unidos de América. Madrid: J. Cosano, [1923], pp. 183, figs. 30*).—A detailed exposition of the production aspect of the cotton industry in the United States is presented as the result of a comprehensive survey.

Annual report of the Indian Central Cotton Committee, Bombay, for the year ending August 31, 1924, G. R. Hilson et al. (*Indian Cent. Cotton Com., Bombay, Ann. Rpt. 1924, pp. IV+73, pls. 7*).—The activities of this organization during the period of this report were similar to those recorded earlier (E. S. R., 50, p. 830). The equipment of the technological research laboratory near Bombay is described and illustrated.

The quality of ratooned Queensland cotton, F. Summers (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 3 (1924), No. 25, pp. 291–294*).—Lint from ratooned Durango cotton plants grown in Queensland appeared to be inferior to that from the ordinary annual crop grown under the same conditions, according to tests at Shirley Institute. The merits of ratooning are discussed briefly.

Influence of early and late planting and sprouting on the yield and dry matter content of potatoes, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1923, p. 25*).—In experiments at Beaverlodge, Alta., by W. D. Albright, the earlier planted unsprouted sets gave larger yields of potatoes with a higher percentage of dry matter. Data from the sprouted series indicate that sprouting before planting may markedly offset the disadvantages of late planting, both as regards yield and dry matter content.

Rhodes grass (Chloris gayana) [trans. title], W. E. Cross (*Rev. Indus. y Agr. Tucumán, 15 (1924), No. 3–4, pp. 41–63, figs. 12*).—The characteristics and history of Rhodes grass are related, and based on experiences in Argentina, its adaptation, cultural requirements, pasture value, seed production, and use in eradicating weeds, on alkali soils, and in mixtures with alfalfa and other legumes are described.

Seasonal variation in paddy, S. K. Mitra, S. N. Gupta, and P. M. Ganguly (*Agr. Jour. India, 19 (1924), No. 6, pp. 590–599, figs. 5*).—The higher yields seemed to accompany late flowering in the Sali varieties of rice and early flowering in the Ans varieties, in tests carried on in Assam. In both groups increased tillering and long culms favored heavier yields. While growth and yield varied with the distribution of rainfall, the seasonal variation in the plats was limited.

Silani, a new cover and forage crop from the Philippines, P. J. Wester (*Sugar Cent. and Planters News, 5 (1924), No. 11, pp. 617–622, figs. 3*).—The silani (*Vigna marina*), a perennial vine, would probably be of value in the moist districts of Hawaii and Porto Rico and possibly in southern Florida. Cattle and horses eat silani cut as green forage, which analyses show to be about two and three times as nutritious as green alfalfa and cowpeas, respectively. The crop makes its best growth where the annual rainfall is evenly distributed. It is a sparse seeder and cuttings are required for extensive plantings.

Fertilizer experiments with sugar cane [trans. title], W. E. Cross (*Rev. Indus. y Agr. Tucumán, 14 (1924), No. 11–12, pp. 149–156*).—Continuation of fertilizer experiments with sugar cane in Tucumán (E. S. R., 47, p. 737), in 1922 and 1923, again gave results confirming those obtained earlier.

The sugar industry and its by-products [trans. title], P. de la Torre (*Cuba Sec. Hacienda, Secc. Estadís., Indus. Azucarera, Zafra 1921–22, pp. 113, pls. 5; 1922–23, pp. 114, pls. 5*).—The tabulated information concerning the

Cuban sugar industry is similar to and supplements that noted earlier (E. S. R., 47, p. 635).

The development of the wheat kernel, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Interim Rpt., 1922, pp. 77, 78*).—Repetition of the experiment by Saunders (E. S. R., 46, p. 36), employing Prelude wheat, gave results confirming those obtained with Marquis.

A contribution to the classification of soft wheats, Triticum vulgare [trans. title], N. I. Vavilov (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 149–257, figs. 6*).—This article is considered as supplementing the monograph of Percival (E. S. R., 46, p. 837), and giving a fuller scheme of the varietal diversity of soft wheats by comparing them with other cereals on the basis of the law of homologous series in variation (E. S. R., 49, p. 822). The question of a fundamental regularity in the geographical distribution of the different varieties and the geographical center of the diversity and the origin of soft wheats are also discussed. This classification lists 67 botanical varieties.

In his explorations in southwestern Asia the author collected many new varieties and new forms within known varieties. Among the novelties were half-awned forms, forms analogous to *Hordeum trifurcatum*, forms with variegated spikes, hairy types, and wheats without ligules and without auricles.

A systematic botanical study of Triticum vulgare ferrugineum [trans. title], E. I. Barulina (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 259–367, pls. 4, figs. 6*).—A detailed botanical study of the systematic characters and races within the variety *T. vulgare ferrugineum* is presented with an English summary. The races are described and classified according to suitable keys, and notes are given on their origin and economic value.

The geographical center of origin and the cultivated areas of durum wheat, [trans. title], A. A. Orlov (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 369–459*).—From a comprehensive geographical survey of the wheat species, north Africa appears to be the center of origin of *Triticum durum*, as well as of other species having the same number of chromosomes. The principal districts where durum is an important crop are the Don, Ekaterinoslav, Samara, Uralsk, and Orenburg Provinces in Russia; Tobolsk and Tomsk in Siberia; Turgai, Akmolinsk, and Semipalatinsk in Turkestan; Georgia in the Caucasus; Spain; southern Italy; certain districts in India; Algeria and Egypt in Africa; North and South Dakota, Montana, Minnesota, Manitoba, and Saskatchewan in North America; and the Chaco in Argentina. The principal variety cultivated is *T. durum hordeiforme*, and the highest yielding durums have included Acme, Arnautka, Monad, Buford, Kubanka, Trigo mecho, Medea, and Peliss (Pelissier).

Wheat of the Government of Stavropol [trans. title], M. Tesnovskii (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 485–508*).—Examination of numerous samples of winter and spring wheat from the Stavropol Government in Russia revealed *Triticum vulgare erythrospermum* to constitute the greatest proportion of the winter forms and *T. durum hordeiforme* to predominate among spring forms.

Triticum monococcum aegilops and T. monococcum cereale in Taurida [trans. title], N. A. Drozdov (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 515–524*).—Varieties of the above were found wild and in cultivation in the Crimea, Russia.

Wild species of Aegilops and their mass hybridization with wheat in Turkestan [trans. title], G. Popovoi (*Trudy Prikl. Bot. i Selek. (Bul. Appl.*

tions by the author have determined 9 varieties of *A. triuncialis*, 6 of *A. cylindrica*, 8 of *A. squarrosa*, and 7 of *A. crassa* in Turkestan and Persia which are grouped in descriptive keys. The typical wild growing species of Aegilops exhibits a complete parallelism in variability with the cultivated species of Triticum, and apparently wild and cultivated species do not differ essentially in this respect. Conditions near Tashkent, Turkestan, favored the mass production of hybrids between Aegilops and Triticum. Of 300 hybrids found in 1921 only 7 produced as many as one kernel per plant. Two plants derived from these seed were similar to Aegilops, while a third was a typical hybrid.

Lawn making, L. Barron (*New York: Doubleday, Page & Co., 1923, rev. ed., pp. VII+176, pls. 31, figs. 2*).—A revised edition of a book noted earlier (E. S. R., 18, p. 444), with a chapter on the requirements of putting greens.

Report on seed analyses, E. M. Gress (*Penn. Dept. Agr. Bul. 395 (1924), pp. 22, fig. 1*).—The average germination and purity are tabulated for 180 samples of agricultural seed collected during the year ended July 1, 1924.

HORTICULTURE

[Horticultural investigations at the Indiana Station] (*Indiana Sta. Rpt. 1924, pp. 29–32, figs. 2*).—As in earlier years (E. S. R., 51, p. 836), this progress report consists for the most part of brief comments upon activities. Selection studies with the tomato have resulted in the development of a high yielding strain known as the Baltimore-Indiana, now grown extensively by the commercial canners of the State.

Yield records taken in 1923 at Laurel upon apple trees under various cultural treatments showed much the highest yield for the trees receiving cultivation with cover crops. These trees averaged 804 lbs. of fruit as compared with 446 lbs. for trees in sod supplemented with straw mulch, and less than 1 bu. for trees in sod without fertilizers or supplemental mulches. The Laurel studies have shown that (1) tillage is the most economical method of soil management, (2) sod without mulch or fertilizer is unprofitable, (3) soil analysis can not be depended upon as an index to productivity, (4) nitrogen is the most important plant food for apples, and (5) the number of bacteria in the soil has an apparent relation to the ammonifying power of soil bacteria, but this power is not influenced constantly by soil practices.

Work with apples at Lafayette continued to show that pruning reduces growth and retards fruiting. At Vincennes severe heading back of the strong terminal growth of young peach trees reduced yields and promoted a heavy rank growth which shaded the fruit on the lower limbs. On the other hand, either a light heading back accompanied by a general thinning of branches throughout the tree or a treatment in which only a part of the terminal branches were cut back resulted in larger yields and less rampant growth. It is deemed likely that the results would be different on old trees.

A comparison at Mitchell of nitrate of soda and sulfate of ammonia as carriers of nitrogen for apple fertilization indicated that when used in equivalent quantities these materials are of equal value. Dusts were again found more costly than sprays and less effective in the control of apple scab.

Improvement work with sweet corn and onions has resulted in the development of some superior strains.

[Horticultural investigations at the Crookston, Minn., Substation], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 57–63, 75–78, fig. 1*).—Based on extensive variety tests, brief comments are offered upon the behavior of vegetable, fruit, and ornamental plants.

[Fruit testing studies at the West Central Experiment Station, Morris, Minn.], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1923, pp. 42–44*).—Brief notes are presented upon the results of tests of various tree and small fruits. The originations from the State fruit breeding farm at Zumbra Heights are showing particular promise, one especially valuable sort being the Latham raspberry.

[Horticultural investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1924, pp. 24–34, fig. 1*).—This is the usual presentation (E. S. R., 51, p. 440) of experimental activities during the year ended June 30, 1924. Fertilizer trials with cabbage and notes on growing head lettuce are included.

A severe freeze occurring April 17, 18, and 19 killed all the fruit save that protected by heaters and some that was not yet in blossom. Among apples the King David, Ralls (Janet), Arkansas Black, Senator, and Stayman Winesap bore from a few belated buds, while the Rome, not yet in blossom, set a good crop. Certain domestica plums bore a little fruit from tardy buds. Grapes, because of their naturally late emergence, were uninjured. In the case of Elberta and Crothers peach trees, which were recorded in full bloom on March 15, orchard heaters succeeded in saving a portion of the fruit, although the temperature within the orchard dropped as low as 26° F. for a brief period. At this time the air without the orchard was 22°. The maximum temperature raise obtained was 5+° on the morning of April 19. Work with the J. H. Hale peach leads to the belief that this variety is slightly hardier in the bud than is the Elberta.

King David and Delicious apple buds inserted in the scaffold limbs of young pear trees grew vigorously at first, but failed to produce as large fruit as was carried on apple top-worked on apple stocks. Yield data on pecan varieties showed very fair production in 1923.

Investigations with vinifera grapes indicated that under irrigation conditions the stump system of training is much more satisfactory than the trellis, the fruit not only being better colored but the bunches and berries larger. That grapes thrive with a minimum supply of water was shown in 1923 in yields of 11,640 lbs. per acre from a little over 1.5 ft. of water applied in six irrigations, the last of which was too late to benefit the fruit.

[Report of the Northern Great Plains Field Station upon] horticultural investigations [from 1913 to 1922], W. P. Baird and T. K. Killand (*U. S. Dept. Agr. Bul. 1301 (1925), pp. 15–46, figs. 2*).—Of the numerous fruit species and varieties tested at Mandan, N. Dak., under conditions which require extreme cold and drought resistant qualities, the native plums, varieties of *Prunus americana* and *P. nigra*, and the red currants have proved the most satisfactory fruits. It is believed that apples, only the hardiest varieties of which have been able to survive, may become more satisfactory as the trees reach greater age. Pears gave satisfaction only when planted as bushes in hedge rows. Sour cherry varieties were not hardy, and ordinary grapes, even when laid down and covered with soil during the winter, failed to bear fruit. The sand cherry, native to the area, was found reliable and highly desirable, the Sioux variety being the best tested. Gooseberries, though not as hardy or as durable as the currants, are deemed of considerable value, as are also Juneberries. Raspberries, requiring winter protection and irrigation, are not considered worth while, and strawberries, although surviving the winter under mulch, apparently require watering in order to assure production.

In a test of four systems of soil management, namely, (1) clean culture, (2) cover crop, (3) straw mulch, and (4) manuring, in relation to hardiness, the best survival in the case of apples was obtained on the mulched plats.

Winterkilling and winter injury were most severe on the clean culture areas. Apples worked on hardy Siberian roots suffered much less with all four treatments than did those on ordinary French crab stocks. The effect of cultural treatments was not so marked in the case of plums, but, in general, plums mulched with straw proved the hardiest. Variations in cultural treatments had little effect on the quality of fruit. Cover crops proved of some value in checking soil blowing and in holding snow. Spacing experiments indicated that close planting favors the establishment of trees by holding snow and affording mutual protection.

Sand cherry plum hybrids pruned to bush form were found more satisfactory than in the standard tree form. Medium and heavy pruning of the Opata and Sansota plums reduced yields but had no apparent effect on hardiness. Winter injury in pears and cherries was reduced by piling straw or old manure about the trunks. Covering the entire trunk or stem of small trees, grapes, and raspberries with soil afforded considerable winter protection.

Of various stocks tested for apple propagation, *Pyrus baccata* gave the best results, while for plum the hardy native plums and the sand cherry proved best, both stocks being hardy, easy to multiply, and forming good unions with the plum varieties adapted to the locality. Propagation studies with cherries and pears yielded unsatisfactory results because of lack of hardiness of the scions.

Although most of the fruit breeding carried on at the station has been of the selection type, some controlled crosses have been made by introducing potted plants into a greenhouse. In apple breeding, *P. baccata* has been used as a hardy parent, while in cherry breeding the pin cherry, sand cherry, *Prunus tomentosa*, and other hardy species have been utilized. Successful crosses were obtained in 1917 between *P. davidiana* and common varieties of peach. In the plum, a fruit upon which the greatest efforts have been centered, the hardy natives, *P. americana* and *P. nigra*, have been crossed with Japanese and domestica plum varieties, sand cherries, apricots, etc. The results of controlled breeding, however, await in most cases the maturity of the seedlings.

The results of extensive tests of ornamental plants are reported in tabular form. Activities in vegetable gardening have consisted for the most part of variety tests. Attempts to improve the tomato by selection for earliness and yield have resulted in considerable progress, some very promising strains having been evolved by hybridization and selection.

[Horticultural investigations at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 18–20*).—In addition to brief reports on the results of variety tests of fruits and vegetables, there are presented comments on miscellaneous investigations. Thinning tests with apples and peaches indicated the necessity of removing part of heavy sets of fruit. A test of the so-called dry mix summer spray as a protection for peaches yielded favorable results. Elberta peaches grown on a shallow soil ripened earlier than those on a deeper and more fertile soil, but were smaller both in fruit and in pit.

[Plant breeding investigations at the Porto Rico Insular Experiment Station], [J. P. Griffith] (*Porto Rico Dept. Agr. and Labor Sta. Rpt., 1924, pp. 51–57, pls. 2; also in Spanish ed., pp. 61–68, figs. 2*).—Among 25 varieties of avocados tested by the station during the year the Fuerte made exceptionally vigorous growth wherever planted on the island. Several forms of Rubus, including raspberries, blackberries, and dewberries, *R. thunbergii*, *R. fruticosus*, *R. lasiocarpus*, *R. ellipticus*, and *R. moluccanus*, were imported for crossing with the native species *R. rosaefolius* in the hope of developing bush fruits adapted to the island. Since European, or vinifera, grapes have been growing on the island for centuries with only limited success, an attempt was

made during the year to introduce varieties, Munson hybrids, muscadines, etc., from southern United States with the expectation of using these introductions for crossing with the native *Vitis caribaca*.

Effects of organic matter in maintaining soil fertility for truck crop production, T. C. JOHNSON (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 277–281*).—The value of humus, either in the form of stable manure or as turned-under crimson clover, was shown in a long-continued fertilizer study at the Virginia Truck Experiment Station, in which white potatoes, sweet potatoes, kale, and cabbage were used as plant materials. Increased yields were especially significant where these humus-supplying materials were supplemented with applications of complete fertilizers. For example, in the case of cabbage, where stable manure and cover crops were supplemented with 4,000 lbs. per acre of a 4–6–8 fertilizer, the yields were 109 and 64.6 per cent, respectively, above the nonhumus area. However, with kale and sweet potatoes humus did not appear to be as important a factor, since satisfactory yields were obtained from the use of commercial fertilizers alone. On all green manure plats and on the stable manure sweet potato plat the yields resulting from the use of 2,000 lbs. per acre of complete fertilizer were in every case larger than those of the corresponding 4,000-lb. plats.

The use of an incomplete commercial fertilizer as a supplement for manure or cover crops resulted in much lower yields than were obtained with complete fertilizers. Where no commercial fertilizer was used fair yields of sweet potatoes and kale were obtained on the manure plats. With no commercial fertilizer the green manure plats yielded only slightly better than the checks and contributed very little organic matter to the soil.

The effects of fruit on vegetative growth in plants, A. E. MURNEEK (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 274–276*).—Observations upon tomato plants, part grown in sand cultures with and without nitrogen and part in a very fertile garden compost, showed in every instance that the presence of a relatively large crop of fruit retarded vegetative development. On small nitrogen-starved plants 1 small fruit was sufficient to inhibit vegetative growth, while on strongly vegetative, nitrogen-supplied plants the presence of as many as 30 large fruits was required to produce the same effect. In both cases the removal of the fruit resulted in a complete recovery of vegetativeness.

The inhibitory effects of fruit on vegetation were shown (1) by the destruction of the fecundity of the flowers, (2) by a decrease in the size of the flower clusters and all floral organs, (3) in a yellowing and abortion of the flower buds, (4) by a decrease and cessation of further elongation of the stem, and (5) in the complete exhaustion and eventual death of the plant. The supposition that even in excessively fertilized plants the fruit apparently monopolizes the incoming and synthesized nitrogenous materials was borne out by the results of chemical analyses, which showed relatively large amounts of insoluble and soluble nitrogen and practically no nitrates in the fruit under all conditions of nutrition. Furthermore, the percentage composition of total nitrogen was always higher in the fruit. Since carbohydrates were found in large quantities in both the fruit and the plant, it is believed that under ordinary conditions carbohydrates are not the limiting factors to plant growth.

In general conclusion the author maintains that in all studies of the nutrition of seed plants proper emphasis should be placed upon the rôle of the fruit in the adjustment of a plant to its external and internal environment. The rather close examination of the behavior of a large variety of plants leads the author to suspect that what occurred in the tomato would probably be true for many other plants.

Influence of stock on the variety, W. L. Howard (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 323–327*).—Three instances are cited in which the stock has apparently directly influenced the behavior of the scion. President plums worked on Formosa and Maynard plums and on the almond ripened their fruit from 10 to 14 days earlier than President on peach stocks. Grand Duke plums worked on Hale Early, Elberta, and Salway peaches, early, medium, and late varieties, ripened one week apart according to the natural maturity dates of the peach stock. Diamond plums growing on almond roots constantly bore defective fruit as compared with normal fruit on peach, myrobalan, and own roots.

Preliminary report on the respiration of apple twigs during the winter, J. H. Beaumont and J. J. Willaman (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 99–104*).—In an attempt to establish a method of artificially testing apple seedlings for hardiness, determinations were made at the University of Minnesota in February and March, 1924, of the amounts of carbon dioxide evolved at 5.3 and 12.4° C. (41.5 and 54.3° F.) from dormant attached twigs of the Delicious and Charlamoff varieties, chosen because of their wide difference in hardiness.

Although the Charlamoff twigs respired more carbon dioxide at both temperatures than did the tender Delicious twigs, the difference was greater at the lower temperature. The observation that the Delicious twigs used in the study were 34 per cent heavier, 25 per cent larger in volume, and carried 56 per cent more buds per unit of length than did the Charlamoff twigs is thought to indicate a possible negative relationship with the total weight of carbon dioxide evolved. The difference in the amount of carbon dioxide evolved by the two varieties is not believed to be due to differences in the extent of the rest period or of dormancy, since there was found no progressive increase or decrease in carbon dioxide output in the various sets of twigs when measured at a given temperature.

The relation of maturity to Jonathan breakdown, P. M. Daly (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 286–291*).—The material herein presented has already been noted from another source (E. S. R., 52, p. 538).

The "Stockton" morello cherry, W. L. Howard (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 320–323*).—Herein is briefly discussed the probable origin and the characteristics of an apparently new type of morello cherry, which in California has proved to be an excellent stock for sweet cherries on soils too heavy and too wet for either the mazzard or mahaleb.

[Fruit thinning studies at the Colorado Station], E. P. Sandsten (*Colorado Sta. Rpt. 1924, p. 30*).—That thinning peaches is a profitable practice was shown by the result of two years' investigations. A block of peach trees carefully thinned after the June drop packed out 99.5 per cent extra fancy fruit, while an unthinned block yielded only 60 per cent of the same quality.

Artificial pollination of the grape [trans. title], A. Longo (*Nuovi Ann. Agr. [Italy], 4 (1924), No. 1, pp. 61–78, figs. 10*).—An illustrated article pointing out the value of cross-pollination in promoting fruitfulness in grapes of pure vinifera and hybrid origin.

The effect of the height of the water table upon cranberry production, B. F. Driggers (*Amer. Cranberry Growers' Assoc. Proc. Ann. Meeting, 55 (1925), pp. 14–16*).—This is a brief contribution from the New Jersey Experiment Stations dealing with a study with the Howes cranberry planted on a mud-bottom bog, so ditched that the depth of the water table in various plats could be regulated and held at desired levels throughout the entire growing season.

The author found a noticeable increase in the amount of decayed fruit as the water level approached the ground surface. For example, in 1923 and 1924 plants beneath which the water level was held at 0 to 2 in. from the surface yielded 35.7 and 27.2 per cent of decayed fruits, as compared with 8.4 and 6.5 per cent for plants beneath which the water table was maintained at a 12- to 15-in. depth.

Where the water table was held high until the blossoming period and then lowered for the remainder of the season the percentage of decay was quite low on all plats. This indicates that growers who hold their water high in the spring as a protection from frost are not materially increasing the risk of decay provided the water is lowered by the time the plants are in blossom.

Production of grape-hyacinth bulbs, D. Griffiths (*U. S. Dept. Agr. Bul. 1327 (1925), pp. 16, pls. 2, figs. 3*).—General information is presented concerning the botanical relationships and varieties of grape hyacinth (*Muscari* spp.), a group of the lily family. Among the subjects discussed are the sources of supply, cultural considerations, harvesting, curing, propagation, demand and uses, and the probable future of the industry.

Chronicles of the garden, Mrs. F. King (*New York and London: Chas. Scribner's Sons, 1925, pp. XII+276, pls. 24, figs. 15*).—A book of general nature dealing with ornamental plants and their utilization.

FORESTRY

Hemlock and its environment.—I, Field records, B. Moore, H. M. Richards, H. A. Gleason, and A. B. Stout (*Bul. N. Y. Bot. Garden, 12 (1924), No. 45, pp. 325–350, figs. 4*).—In order to ascertain some of the factors determining the establishment of hemlock, field stations were established by the New York Botanical Garden, in cooperation with Yale, Cornell, and Syracuse Universities, at various points in the northeastern hemlock belt. At each station weekly readings were taken during the summer of 1923 upon evaporation, solar radiation, precipitation, and the temperatures of the air and soil.

Despite their wide geographic separation, the average daily evaporation records of the five hemlock stations were very similar, being 12.2, 12, 10.3, 11.8, and 7.5 cc. at New York City, New Haven ridge top, New Haven north slope, Ithaca, and Cranberry Lake, N. Y., respectively. Contrary to expectation, the average daily evaporation in a hemlock stand was found to be considerably higher than in a neighboring hardwood stand consisting largely of oaks. The difference between evaporation in two contrasting hemlock stands near New Haven was less than the difference between the hemlock and the hardwood stands at New York City.

As compared with contemporary records taken on spruce and white pine at Mount Desert Island, Me., the rate of evaporation under hemlock was intermediate between the spruce and the pine. The air temperature under hemlock showed a higher maximum and mean but a slightly lower minimum than under hardwoods. In respect to soil temperatures, hemlock stands at both 6- and 18-in. depths were cooler than hardwoods.

Since the extreme range of temperature between the northern and southern stations was small, being only 12° F. for mean air temperature and 10° for mean soil temperature at 6 in., and since the northerly station, at Cranberry Lake, is deemed to be about the northern temperature limit of hemlock, the authors believe that a comparatively small temperature range may be of considerable importance in determining the distribution of this as well as other species.

On the trail of the vanishing spruce, D. S. JEFFERS and C. F. KORSTIAN (*Sci. Mo., 20 (1925), No. 4, pp. 358–368, figs. 11*).—A general article, pointing out the rapid exploitation of red spruce and the Fraser fir in the southern Appalachian region and the need of conserving these species if they are to be maintained in a profitable condition.

Coincidence between the ranges of forms of western yellow pine, bark beetles, and mistletoe, C. F. KORSTIAN (*Science, 61 (1925), No. 1582, p. 448*).—Bearing out the suggestions presented in an earlier paper (E. S. R., 51, p. 348), namely, that Pacific coast and Rocky Mountain forms of western yellow pine are silvically distinct, the author reports that F. C. Craighead of the U. S. Department of Agriculture has found that the ranges of two species of bark beetles correspond with the ranges of the two forms of western yellow pine. Furthermore, Hedgcock (E. S. R., 34, p. 448) found that the ranges of two forms of mistletoe living on the western yellow pine also coincide with the ranges of the two forms of pine. These two parallel cases are deemed by the author to strengthen the conception that biological forms change rapidly in response to environmental influences.

[Report upon] arboricultural investigations [at the Northern Great Plains Field Station], R. WILSON (*U. S. Dept. Agr. Bul. 1301 (1925), pp. 7–15, figs. 2*).—The testing of tree species and methods of culture thereof has been one of the important activities of the station at Mandan, N. Dak., since its establishment. Herein are presented in tabular form the results of extensive tests begun in 1914, pointing out those species which are able to endure the adverse temperature and moisture conditions which obtain in the area. The results of cooperative shelter-belt tests are again reported in detail (E. S. R., 48, p. 448; 49, p. 141).

The forests of the valley coal fields of Virginia, F. C. PEDERSON (*Va. Geol. Survey Bul. 25 (1925), pp. 301–316, pl. 1*).—A general article relating to the forests typical of the Virginia coal fields, paying attention to the species, general character of the forests, the necessity of excluding fire, etc.

The forests of British Guiana, L. S. HOHENKERK (*Empire Forestry Jour. [London], 3 (1924), No. 2, pp. 169–179, pls. 4*).—A brief discussion concerning the forest resources and the characteristics of the more important constituent species.

Report of the National Forest Reservation Commission for fiscal year ended June 30, 1924, J. W. WEEKS ET AL. (*U. S. Senate, 68. Cong., 2. Sess., Doc. 184 (1925), pp. VI+32*).—Data are presented concerning the amount and distribution of lands purchased or approved for purchase during the period considered.

Biennial report of the Forestry Commission for the two fiscal years ending June 30, 1924, W. R. BROWN ET AL. (*N. H. Forestry Comn. Bien. Rpt. 1923–24, pp. 139, pls. 6, figs. 12*).—Accompanying general administrative data, there is included a comprehensive discussion of the historical development and the present status of forestry in New Hampshire.

Fourteenth annual report of the State forester to the governor for the year ending December 31, 1924, F. A. ELLIOTT (*Oreg. State Forester Ann. Rpt., 14 (1924), pp. 53, figs. 13*).—This is the usual report (E. S. R., 52, p. 241).

Report of the director of forestry for the fiscal year ended March 31, 1923, R. H. CAMPBELL (*Canada Dept. Int., Rpt. Dir. Forestry, 1923, pp. 38, figs. 12*).—This report covers the work of the forestry branch of the Canadian Department of Interior for the year ended March 31, 1923.

Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1923–1924, A. R. DICKS (*Bihar and Orissa*

Forest Admin. Ann. Rpt. 1923–24, pp. [77], pl. 1).—This is the usual annual progress report (E. S. R., 50, p. 838), containing not only a review of the activities for the year ended March 31, 1924, but also a summary of progress for the five-year period from 1919–20 to 1923–24.

Report on the forest administration in Burma for the year ending 31st March, 1924, C. B. SMALES (*Burma Forest Admin. Rpt., 1924, pp. [5]+198, pls. 8*).—The usual administrative report (E. S. R., 51, p. 45).

Progress report of forest administration in Coorg for 1922–1923, A. F. MINCHIN (*Coorg Forest Admin. Rpt. 1922–23, pp. [35]*).—The usual administrative report (E. S. R., 50, p. 141).

DISEASES OF PLANTS

[Plant disease studies of the Colorado Station, 1924], W. G. SACKETT (*Colorado Sta. Rpt. 1924, pp. 18, 19, 20*).—Wragg cherry bacterial disease, subjected to inoculation studies for several years without results, was further studied by employing earlier in the growth of the cherries a culture isolated in 1923 and grown in laboratory media for nearly one year. This culture gave, early in the spring of 1924, 100 per cent infection in the young green cherries under field conditions. It is thought that the development of acidity during growth may explain former failures to secure inoculations. The causal organism appears to be similar to or identical with *Pseudomonas pruni.*

Alfalfa wilt or root rot reappeared generally over the State in the early spring of 1924 in aggravated form, destroying hundreds of acres of alfalfa. An examination of the root shows that the crown may be badly decayed while the lower part remains sound. A slimy exudate from the brown vascular bundles yielded bacteria, and these, or perhaps fungi, may cause the disease.

In studies of the effect on germination of mercuric chloride 1:1,000 on seeds of cantaloupe, cucumber, and honeydew, the results indicated that seeds possessing high initial germinability were practically unaffected, while those of low initial germinability were appreciably damaged.

[Report of the Indiana Station] department of botany (*Indiana Sta. Rpt. 1924, pp. 13–20, figs. 9*).—New evidence has been obtained to the effect that a very destructive greenhouse streak or winter blight of tomatoes is really a severe manifestation of mosaic. Potato leaf roll reduced yield 38 per cent at Hammond, 52 per cent at La Fayette, and 66 per cent at Wanatah.

Experimental work has shown definitely that most of the apple blotch cankers on bearing wood result from petiole infection. It is now known that blotch may be cut out of young plantings, also that Bordeaux mixture will control the trouble.

What is apparently a new disease was noted on Bonnie Best tomato, a black stem-end rot due to *Cladosporium fulvum.* The fungus penetrates the seed and this infects the seedlings.

[Plant diseases and pests] (*New Mexico Sta. Rpt. 1924, pp. 18, 19, 20, 36*).—A definite lack of correlation between soil moisture percentages and chili pepper wilt percentages during two years was found to be due to unequal soil infection in different localities, and in the spring of 1924 chili was grown on soil that had not previously grown this crop, wilt cultures being placed at the base of each plant. From the season's data a definite correlation between soil moisture and wilt percentage seems apparent.

Chlorosis in fruit trees was at least temporarily controlled by the use of iron sulfate inserted into holes bored into the trunks. In about three weeks a healthy green leaf color began to prevail. Dosage tests are to be carried out, also tests regarding the continuance of the beneficial effect.

Texas root rot destroyed many cotton plants in the Mesilla Valley, causing also serious losses of locust trees in the Pecos Valley. *Tylenchus dipsaci* was found to cause a distinct rotting of stem bases and crowns of alfalfa plants in San Juan County.

Annual report of the division of plant pathology and botany for the fiscal year 1923–24, M. T. Cook (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1924, pp. 79–87; also in Spanish ed., pp. 89, 91–97, 99, 100*).—This report follows up the author's account of Porto Rico plant pathology (E. S. R., 51, p. 542).

Notes are given on two sugar cane leaf spots, probably both due to *Helminthosporium sacchari*. A premature coconut nut drop was connected with *Thielaviopsis paradoxa*.

The most important plant diseases of the year are listed.

[Plant disease studies, Porto Rico Insular Station, 1923–24], R. Menéndez Ramos (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1924, pp. 24, 25, 27, 28; also in Spanish ed., pp. 25, 26, 29, 30*).—Extensive studies were made on sugar cane leaf spot disease, which caused serious damage along the northern coast from Vega Baja to Manati, especially to the variety D. 109. Similar outbreaks at Santa Rita, Guanica, affected mainly B. H. 10(12). Both these outbreaks were found by M. T. Cook to be due to strains of Helminthosporium. Gumming disease, owing to resistant varieties and eradication of such carrier canes as Otahiti, has ceased to be a menace in Porto Rico.

Experimental control of a tobacco seed bed disease (*Phytophthora* sp.) was secured by soil sterilization in studies carried on by Cook. In experiments conducted by F. Sein, jr., on mosaic transmission, using *Aphis maidis*, *Sipha flava*, *Hysteroneura setariae*, and *Carolinaia cyperi* as vectors, the disease was transmitted only by *A. maidis* and that only to *Echinochloa colona*.

Annual report of the mycologist for the year 1923, J. McDonald (*Kenya Colony Dept. Agr. Ann. Rpt. 1923, pp. 81–85*).—The coffee berry disease of the Uasin Gishu Plateau and Trans Nzoia districts, though it has not been as yet certainly identified, is believed to be due to *Colletotrichum coffeanum*, previously known in connection with minor leaf and berry spots and with die-back. Madagascar butter beans were affected by a disease associated with a fungus somewhat resembling *Vermicularia capsici*, said to cause a disease of chili pepper in India. The same disease, supposedly, was found on wild *Dolichos lupiniflorus*, also on pigeon pea, and is readily controllable by means of Bordeaux mixture. Kafir was affected with a smut-suggesting fungus, reported to be *Cerebella sorghi-vulgaris*, and not previously known to be attacking the native sorghums closely related to kafir. Local sources of quicklime were found to give a product of quality sufficiently good to permit its use in making Bordeaux mixture and lime sulfur. Dust spraying experiments were not encouraging as to results, the powders not being sufficiently adherent.

Report was made for the first time in the Colony of coffee pink disease (*Corticium salmonicolor*), bean disease (*V. capsici* ?), celery late blight (*Septoria petroselini apii*), and apple root disease (*Botryodiplodia theobromae*).

Annual report of the Government mycologist, W. Small (*Uganda Dept. Agr. Ann. Rpt., 1923, pp. 14, 15*).—The usual coffee diseases were present. Three small fungi, *Meliola glabra* (*M. aibonitensis*), *Calonectria* sp., and *Arthrosporium parasiticum*, were found for the first time in association with a sooty mold on coffee leaves, stems, and berries. A fungus resembling *Rhizoctonia lamellifera* was found on young coffee ([*Coffea*] *arabica*) attacked by cutworm. Hevea brown bast experiments of the previous year gave in-

conclusive results. Cotton areolate mildew (*Ramularia areola*) and boll anthracnose (*Glomerella gossypii*) were present but not dangerous. Cotton shoot die-back, causing loss of bolls, is probably of physiological origin. The host list of *Armillaria mellea* has been extended provisionally to include limes, *Caesalpinia pulcherrima*, *Cassia florida*, and *Jacaranda mimosaefolia*. *Sclerotium rolfsii* on carnations and on soy beans may have been due to factors contributory to weakness on the part of the hosts. The cause of a die-back of *Grevillea robusta* appears to be a new fungus, which has been named *Rhizoctonia lamellifera*. It also kills *Casuarina equisetifolia* and *coffea robusta*, and may prove to be weakly parasitic on *C. arabica*.

Annual report of the mycologist for 1923, A. THOMPSON (*Malayan Agr. Jour., 12 (1924), No. 8, pp. 246–251*).—Brief notes are given on local plant diseases, including Hevea brown bast, moldy rot (*Sphaeronema fimbriatum*), molds (saprophytic), black stripe (*Phytophthora* sp.), a possibly new bark disease (fungus undetermined), root diseases (*Fomes lignosus* and *F. pseudoferreus*), die-back (root disease, soil wash, dryness, and flooding), and pink disease (*Corticium salmonicolor*): coconut bud rot, a threatening new disease (spreading by root contacts), stem bleeding (three distinct types), leaf spot (*Pestalozzia palmarum*), and red ring disease (nematodes ?); African oil palm bent-leaf disease (one case); gutta-percha Diplodia attack, also a fungus attacking collar and roots, brown root, and chlorosis; tea diseases (bad cultivation); roselle (*Hibiscus sabdariffa altissima*) die-back (*Phoma* sp.), bacterial wilt, and nematode attack; tobacco nematodes, *Bacillus solanacearum*, and *Cercospora nicotianae*; tuba root (*Derris elliptica*) pink disease (*Corticium salmonicolor*); Jerusalem artichoke (*Helianthus tuberosus*) Rhizoctonia attack; maize grain attack by *Helminthosporium* sp.; and Borneo camphor root disease (*Rosellinia bunodes*).

Leaf gummosis [trans. title], J. DUFRÉNOY (*Compt. Rend. Soc. Biol.* [*Paris*], *88 (1923), No. 2, pp. 122–124, figs. 6*).—A localized or more generalized bacterial gummosis affecting such structures as leaves and phyllodes is depicted, particularly in connection with Mimosa.

Mistletoes attacking cultivated trees in Malaya, W. N. SANDS (*Malayan Agr. Jour., 12 (1924), No. 3, pp. 64–76, pls. 3*).—Mistletoes are common, often serious, pests of cultivated trees in Malaya, the more injurious of such parasites being *Loranthus ferrugineus*, *L. pentandrus*, *L. grandifrons*, *L. pentapetalus*, and *Elytranthe globosa*, though notes are given on *E. barnesii* and *E. platyphylla*, also on *Viscum articulatum* and *V. orientale*.

The employment of sulfur as fungicide [trans. title], G. HÖSTERMANN (*Gartenwelt, 28 (1924), No. 18, pp. 183, 184, fig. 1*).—Discussion, data, and suggestions are offered regarding the methods and effects of employing sulfur, mainly in vaporized and oxidized form, as protection for plants indoors against disease.

The fungicidal action of coloring matters from tar [trans. title], E. W. SCHMIDT (*Centbl. Bakt.* [etc.], *2. Abt., 60 (1923), No. 14–17, pp. 329–338*).—Description, tabulation, and discussion are presented of experimentation regarding the effects of different tar products on phytopathogenic microorganisms.

1924 revised spray program [Oregon], H. P. BARSS and A. L. LOVETT (*Better Fruit, 18 (1924), No. 8, pp. 30–32, figs. 2*).—Since there are, speaking generally, more diseases and pests requiring spray treatment west than east of the Cascades, the authors tabulate the full spray program for the western humid section only, with outline for the other sections.

Varietal susceptibility of oats to loose and covered smuts, G. M. REED, M. A. GRIFFITHS, and F. N. BRIGGS (*U. S. Dept. Agr. Bul. 1275 (1925), pp. 40,*

pls. 3).—The investigations here recorded continue those previously reported by Reed (E. S. R., 44, p. 747), studies on the varietal resistance and susceptibility of oats to *Ustilago avenae* and *U. levis* being carried out at Columbia, Mo., Ames, Iowa, Manhattan, Kans., Aberdeen, Idaho, Pullman, Wash., and Brooklyn, N. Y. Strains and varieties of *Avena brevis*, *A. fatua*, *A. ludoviciana*, *A. nuda*, *A. sativa*, *A. sativa orientalis*, *A. sterilis*, and *A. strigosa* were grown. These gave in general similar results.

Of the 6 strains of *A. brevis* grown, 5 were similar and gave negative results with both smuts except in one doubtful case. In the case of the sixth strain, which showed 4 instances of infection out of 1,016 plants exposed to *U. levis*, differences from the other strains are noted, in particular later maturity. Negative results were observed with *U. avenae* in the total of 850 plants grown. Of the 3 strains grown of *A. fatua*, all proved susceptible. Of the 5 strains grown of *A. ludoviciana*, 4 proved moderately susceptible, the fifth highly resistant. Of the 7 strains and varieties grown of *A. nuda*, all were highly susceptible to both smuts.

A sativa was represented by over 90 varieties and 182 strains. These showed a wide range as regards susceptibility, a few proving highly resistant, including Black Mesdag, Culberson (S. N. 295), Caucasus, Danish Island (S. N. 311), and Siberian (S. N. 323). The larger number of highly susceptible forms included Canadian, Early Champion, Golden Drop, Irish Victor, Japan Selection, June, North Finnish, Sixty-Day, and Victor. Several varieties, including Bicknell ([selections] S. N. 341 and 342), Black Diamond, Danish, Danish Island (S. N. 149), Early Gothland, Rossman, and Scottish Chief, appeared more susceptible to *U. avenae* than to *U. levis*, the opposite appearing to be true in the case of C. I. No. 620 (S. N. 148), Green Russian (S. N. 203 and 314), Monarch (S. N. 161), and Tobolsk (S. N. 122).

All the varieties of *A. sativa orientalis* appeared to be susceptible. The wild forms of *A. sterilis* were moderately susceptible to both smuts. Such cultivated forms as Burt, Fulghum, and Red Rustproof showed a marked resistance to both smuts.

A. strigosa was represented by 4 strains. No infected plants were observed among the 4,824 inoculated with *U. avenae* and 3,736 inoculated with *U. levis*.

The results in the greenhouse were comparable to those obtained in the field experiments. Resistant varieties maintained their resistance to both smuts, and susceptible varieties were severely attacked. Under greenhouse conditions the formation of pustules of smut spores on the upper leaves of susceptible varieties was conspicuous in both *U. avenae* and *U. levis*.

Smut treatment tests, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 43, 44*).—From trials begun in 1922 in cooperation with the central station to determine the relative merits of several smut treatments on wheat, oats, and barley, the data for the two years are tabulated.

On a 2-year average the formaldehyde treatment gave the best control, no smut occurring in either year in the wheat or oats so treated, and only a trace in barley in 1923. The wheat so treated gave 3.6 bu. less than the untreated, but it showed 7.7 per cent less smut. Oats yielded after the formaldehyde treatment 4.7 bu. less than untreated, but these had 5.4 per cent less smut. Barley treated yielded 23.4 bu. more than untreated, with 2.4 per cent less smut.

In 1923 all treatments controlled equally wheat smut, but in 1922 formaldehyde surpassed Seed-O-San and copper carbonate. On oats and barley copper carbonate was more effective than Seed-O-San or a mixture of the two, but less so than was formaldehyde.

It is thought that probably formaldehyde reduces yield, even when storage or delay effect is eliminated by planting immediately.

Copper carbonate was not so effective in smut control as formaldehyde, but with it there was an increased 2-year yield. It eliminates the danger of storage injury after treatment and does not cause the seed to swell. Its main objectionable feature, apparently, is its nauseating effect when inhaled.

Comparative rust susceptibility of wheat varieties, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1923, p. 19*).—In cooperation with the Bureau of Plant Industry, U. S. D. A., a rust nursery has been developed for comparing varietal susceptibility of wheats to rust as shown by the size of the pustules, and the results here indicated numerically according to rust pustule size on a scale of from 1− to 4+. Exceptionally resistant are spring emmer, Monad, Acme, and Pentad (all designated as 1−), and Khapli emmer (1). Kota stands at 3, Arnautka (1493) at 4−), Peliss, Kahla, and Arnautka (6236) at 4+, and all the rest of the 22 wheat varieties at 4, as regards susceptibility to rust.

[**Cotton boll shedding**] (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 23, 24*).—In a greenhouse study of the cotton plant, cotton boll shedding appeared to be in inverse ratio to frequency of cultivation. It was heavy from 6 to 8 days after a sudden drop in temperature, but it was not affected materially by high temperatures or by slight variations. The average period of persistence (square appearance to shedding) was about 25 days. The period from the appearance of squares to blooming was from 35 to 40 days. When shedding occurred after blooming it averaged 6.5 days for the continuous fruiting branches, 6.8 for the vegetative branches, and 8 days for the short determinate branches. Fewer squares borne on short determinative branches were shed than on continuous fruiting and vegetative branches, and these latter differed only slightly between themselves.

[**Potato scab control experiments, Minnesota**], C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 64–66*).—The sulfur soil potato scab test was continued and enlarged in 1923, this making the third consecutive potato crop on the plats so used, which were planted with the varieties Irish Cobbler, Early Ohio, and Green Mountain. Early Ohio was much less diseased on the check plats than were such white skinned potatoes as Irish Cobbler.

Samples of soil from the different plats when tested for pH values showed for inoculated sulfur in 1923 a pH of 7.93, Toro Agricultural Compound 8.25, and check plat 8.1, and inoculated sulfur in 1922–23 a pH of 8.06. Texas Gulf inoculated sulfur reduced alkalinity more than did the Toro compound. It was reported also that the soils from the Northwest Experiment Station are very highly buffered, taking up considerable acid with but little change apparent in H-ion value.

The reports of tests, as tabulated, show differences which were negligible as regards yield from the various treatments, though apparent as to the way in which scab was controlled and as to the varietal effects of soil treatment. Green Mountain on the sulfur plats showed considerable russeting. The percentage of scab-free potatoes on the sulfur plats ranged from 28.2 to 45.3 and on the Toro plats from 1.8 to 29.7.

Apparently 400 lbs. of sulfur per acre is too little to produce a sufficiently favorable soil reaction to base knowledge of soil and disease effects.

In the potato tuber disease treatment tests, Irish Cobbler seed was used at the end of a 5-year rotation period, which apparently was too short to eliminate potato scab from the soil. The seed tubers used showed deep scab and black scurf. Corrosive sublimate at 4 oz. to 30 gal. of water and hot formal-

dehyde (120° F.) at 2 pints to 30 gal. of water were used, the tubers being soaked for 1.5 hours in the former or for 3 minutes in the latter solution.

The differences obtained in yields were supposedly due to the control of Rhizoctonia, the average percentage of black scurf after formaldehyde being 8.6, after corrosive sublimate 11, and after no treatment 26.5. All tubers showed some scab, heavy infestation showing to the extent of 5.1 per cent on the formaldehyde plat, 17.5 on the sublimate plat, and 30.3 per cent on the check plat. It is concluded that formaldehyde is more effective than is corrosive sublimate in killing spores on potato seed having deep scab lesions.

No effect was apparent where observation rows planted with scabby seed were dusted with inoculated sulfur.

Cultural studies with Gibberella saubinetii (Mont.) Sacc. which is parasitic on rice-plant, M. Kasai (*Ber. Ōhara Inst. Landw. Forsch., 2 (1923), No. 3, pp. 259–272*).—It is stated that of the two types of fusariose attacking rice in Japan, one being due to *Lisea fujikuroi* and the other to *G. saubinetii*, the phases here dealt with concern only the latter organism, which is somewhat commonly distributed over that area. The author outlines the modes of attack, cultural studies, and tests with the pigment produced.

The organism causing seedling blight, head blight, and stem rot in rice plants, previously included under the collective name (for several species, really) *Fusarium roseum*, is said to have been shown with certainty by cultural studies here outlined to be identical with *G. saubinetii*, the conidial form being *F. graminearum*.

The spraying of apple trees (*Gard. Chron., 3. ser., 76 (1924), No. 1979, p. 363*).—The general conclusions from observations said to have been carried out in a joint program arranged by the East Malling Research Institute and the Southeastern Agricultural College, Wye, on the effects of sprays on apple scab, are to the effect that Bordeaux mixture (10–10–100), with 4 lbs. of lead arsenate to the 100 gal., applied just before blooming is an excellent spray for apples.

Pertinent pointers on brown rot of stone fruits, G. L. Zundel (*Better Fruit, 18 (1924), No. 10, pp. 7, 25, fig. 1*).—Stone fruit brown rot, especially destructive to prunes and cherries west of the Cascades and causing excessive loss in 1923 owing to weather conditions, is described as to forms of loss, with discussion of control measures. These include sanitation and the two fungicides Bordeaux mixture 3–6–50 and commercial lime sulfur 1–40, with some such adhesive as Kayso.

Rot epidemic is serious [Oregon, 1923], D. F. Fisher and H. P. Barss (*Oreg. Grower, 5 (1924), No. 7, pp. 11, 14, figs. 2*).—Regarding the serious outbreak of prune brown rot which destroyed about one-third of the crop in 1923, and which is ascribed to a concurrence of favoring conditions, an account is outlined pending a fuller report. Spraying is indicated wherever showery weather or heavy dews prevail, especially during the ripening of the fruit.

Some grape diseases in Japan [trans. title], Y. Nisikado (*Ber. Ōhara Inst. Landw. Forsch., 2 (1923), No. 3, pp. 273–289, fig. 1*).—Of the three grape diseases here asserted to have become important in eastern Japan the author mentions *Glomerella rufomaculans* as present for some years and as having been reported on by Shirai and Miyake (E. S. R., 38, p. 426) and by Hemmi (E. S. R., 46, p. 239). He reports as of recent arrival in Japan, the grape diseases connected with *Physalospora baccae* and with *Coniothyrium diplodiella*, discussing systematically in some detail these two grape diseases.

Oidium of the vine, F. de Castella and C. C. Brittlebank (*Jour. Dept. Agr. Victoria, 22 (1924), No. 2, pp. 98–108, figs. 6*).—Dry and wet applications,

and distributors, are discussed as to the methods, values, and limitations in connection with grape Oidium (*Uncinula spiralis*).

Bananas resistant to wilt (Panama disease), S. F. Ashby (*Trop. Agr. [Trinidad], 1 (1924), No. 11, pp. 172, 173*).—Wilt is practically excluding Gros Michel or Martinique banana, the only variety grown on a great scale for export to northern markets. The infection appears to persist in soil for at least 12 years. Of the varieties tested, Bumulan appears promising, or at least worthy of further trial. A variety known as Giant Fig appears highly resistant after partial trials. A banana said to resemble closely Gros Michel has shown resistance.

Windburning of citrus trees, W. M. Mertz (*Calif. Dept. Agr. Mo. Bul., 13 (1924), No. 1–6, pp. 46–53*).—The unnatural conditions to which citrus trees in California are subjected result frequently in wind burning or dehydration of leaves and twigs by removal of water in dry, rapidly moving air faster than it can be supplied naturally up the trunk from the soil. Fully 50 per cent of the citrus acreage in California is subjected at times to wind burning, which is, however, limited largely to oranges, the navel varieties appearing to be the most susceptible. Soil water supply in sufficient quantity is the most favorable single factor, though careful attention to each phase of orchard management is requisite. Windbreak protection may be practical if proper attention is paid to the water and fertilizer requirements of both orchard and protective trees.

Fungoid diseases [of coffee, Africa], A. D. le P. Trench (*Kenya Colony Dept. Agr. Ann. Rpt. 1923, pp. 94, 95*).—The list of local diseases related to coffee includes root rot, leaf spot (*Cercospora* sp.), brown blight (*Colletotrichum* sp.), *Phoma* sp., and leaf disease; black blight; pink disease; plateau berry disease (poor cultivation); and empty berries.

Black rot or koleroga of coffee in Mysore, L. C. Coleman, M. K. Venkata Rao, and M. J. Narasimhan (*Mysore Dept. Agr., Mycol. Ser. Bul. 5 (1923), pp. 12, pls. 4, fig. 1*).—The disease of coffee known throughout the south of India as black rot, and in Mysore as koleroga, is said to have appeared in that region not far from 50 years ago. It has since been noted in various warm countries, so that now its distribution is considered as almost general throughout the Tropics. The fungus is said to have been correctly described by Von Höhnel in 1910 as *Corticium koleroga*. The characteristic features of the disease are the production of discoloration of the leaves and berries and the presence of a web or pellicle growing over the berries and the lower leaf surface, constricting at the petiole to a strand which extends on to the leaf-bearing twig, rarely to the main stem and never to the ground. A very characteristic feature is the suspension by the fungus of the leaves, which are killed, as are also the berries.

No haustoria are shown by the fungus, which apparently does not penetrate even the epidermal cells of the leaf, but which interferes with respiration by blocking the stomata, and which probably also affects the tissue by means of a secretion containing an enzyme or toxin. The fungus flourishes destructively under the moist conditions which prevail during the southwest monsoon. It carries over by means of sclerotia-like resting bodies formed in the mycelial web. It is spread by means of basidiospores and by the mycelium.

The same or a closely related fungus has been found on at least seven other local plants, from one of which direct infection of the coffee tree has been traced.

Observations indicate the advisability of thorough pruning and sanitation before the break of the monsoon. Bordeaux mixture in late May or early June, rather as a preventive than curative, is also advised, with the addition of an

adhesive, as resin soda or calcium caseinate, made according to the formula recommended by the Mysore Department of Agriculture, as outlined.

Diseases and pests of rubber [and] of coconuts, F. W. SOUTH (*Malayan Agr. Jour., 12 (1924), No. 8, pp. 220–226*).—Rubber pink disease (*Corticium salmonicolor*) proves to be controllable by careful attention. Mistletoes (*Elytranthe globosa* and *Loranthus pentandrus*) are giving trouble on rubber estates, particularly in Malakka. Moldy bark rot (*Sphaeronema fimbriatum*) has spread in some localities. Black stripe (*Phytophthora* sp.) is still bad at Jelebu and Pertang in Negri Sembilan. *Cyphella* sp. shows indications of becoming more virulent on rubber. *Fomes lignosus*, when neglected, does serious damage to mature rubber trees. *F. pseudoferreus*, *Ustulina zonata*, and brown root disease were fairly common. Mention is made of patch canker, die-back, brown bast, *Sphaerostilbe repens*, and sunburn wounds on thin renewing bark followed by *Gloeosporium* sp.

A coconut frond wilt and collapse appears to be due to an organism, not determined, favored by rainy weather. A few cases of bud rot and leaf break were reported.

Some wood-destroying fungi of Java, E. A. BURT (*Ann. Missouri Bot. Gard., 11 (1924), No. 1, pp. 37–42, pl. 1*).—Record is made of a few higher fungi sent by C. Hartley from Java in 1921 and subsequently classified, some having both taxonomic and economic interest. The list includes 10 genera, with 15 species, in four families.

A bacterial wilt of cosmos, M. T. COOK (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 4, p. 14*).—At and near the Insular Experiment Station a bacterial wilt of cosmos has proved very destructive. The foliage wilts and blackens. Removal of bark near the ground shows brown or black discolorations which may extend into the branches and roots. The tracheary tubes contain abundant bacteria, sometimes a fungus. Cultures almost invariably develop a bacterium and a Fusarium. Inoculation proved the bacteria to cause the trouble.

Die-back disease of rambler roses (*Gard. Chron., 3 ser., 76 (1924), No. 1979, p. 374*).—Credit is given to W. J. Dowson as to an account of a die-back of rambler roses at Wisley which had been overgrown by wild roses and brambles. A fungus was later isolated from the rambler roses, and this was found capable of infecting both wild roses and brambles. The fungus is said to be identical with *Gnomonia rubi* and to cause, under certain conditions, serious damage to both Rosa and Rubus.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The ground squirrels of Colorado, W. L. BURNETT (*Colo. State Ent. Circ. 44 (1924), pp. 19, pl. 1, figs. 3*).—The information here presented supplements that given in an account previously noted (E. S. R., 44, p. 849). Particular attention is given to the Wyoming ground squirrel, *Citellus elegans* (Kenn.), and the striped ground squirrel, *C. tridecemlineatus pallidus* (All.).

Rabbit destruction, F. W. GAVEL (*Agr. Gaz. N. S. Wales, 35 (1924), No. 11, pp. 813–815*).—This is a brief account of the methods employed in control and eradication work in New South Wales.

The Spanish sparrow (Passer hispaniolensis transcaspicus Tschusi): A pest of grain crops in Dongola Province, H. H. KING (*Wellcome Trop. Research Labs., Ent. Sect. Bul. 20 (1923), pp. 22, pls. 4*).—This sparrow caused considerable damage to grain crops in Dongola Province, Anglo-Egyptian Sudan, during the winters from 1917 to 1920. It is concluded that the use of nets when the birds are all roosting together, immediately after their arrival

and before they have had time to cause much damage to crops, is a practical and relatively inexpensive method of coping with the Spanish sparrow in that Province.

General insect investigations [at the Colorado Station], C. P. Gillette (*Colorado Sta. Rpt. 1924, pp. 27, 28*).—The Mexican bean beetle has been spreading through Delta County, where it did rather serious damage to beans being grown for the cannery, and it became established in Mesa County during the year. It promises to become one of the most serious pests of beans on the western slope. The oyster-shell scale has become a very serious enemy of shade trees in Fort Collins and some other sections of the State, especially of ashes, cottonwoods, willows, and purple lilacs.

The alfalfa nematode, or eelworm (*Tylenchus dipsaci*), has been found to be widely distributed in Colorado. It occurs in practically all of the alfalfa-growing sections, is rather common in the alfalfa fields of the western slope, occasionally in northern Colorado, in Weld and Larimer Counties, and it has also been taken in the Arkansas Valley from Canon City to Lamar. The severe dying out of alfalfa that occurred during the spring in many places did not appear to be due, to any considerable extent to this pest. The alfalfa weevil, which infests in small numbers a considerable part of Delta County, a comparatively small area in Montrose County, and a very small area in Gunnison County, did little damage, the reduction in its numbers being due, it is thought, to the introduced parasite *Bathyplectes curculionis*.

Fifteenth annual report of the State entomologist of Colorado for the year 1923 (*Colo. State Ent. Circ. 43 (1924), pp. 71, figs. 10*).—Included in this report are accounts of the Alfalfa Weevil (*Phytonomus posticus*): Progress Report for 1923, by J. H. Newton (pp. 14, 15); False Wireworms, by J. L. Hoerner (pp. 17, 18); Alfalfa Nematode or Eel-worm (p. 18) and Injuries of a Leaf-Cutter Bee, *Lithurgus apicalis* Cress., to Telephone Poles, both by C. P. Gillette (pp. 18, 19); Codling Moth Ovicides, by G. M. List and J. L. Hoerner (pp. 24–28); Trapping Codling Moths, by J. H. Newton (pp. 29–31); Codling Moth Traps, Grand Junction, Colo., by W. P. Yetter, jr. (pp. 32–38); Codling Moth Work in Delta and Montrose Counties (pp. 38, 39), Effect of Loose Bark on Codling-Moth Band Records (p. 39), and Codling Moth Injury to Sweet Cherries (p. 40), all by J. H. Newton; Work at the Grand Junction Field Station, by W. P. Yetter, jr. (pp. 40–44); Grasshoppers (pp. 44–48) and Morgan County Grasshopper Campaign, 1923 (pp. 48, 49), both by C. L. Corkins; A Peculiar Egg-Laying Experience with the Spider Parasite *Oncodes costatus* Loew., by C. P. Gillette (pp. 49–51); Notes on Rodent Pests, by W. L. Burnett (pp. 51–60); an account of Apiary Inspection and Investigation, by N. Boggs (p. 61); and an insect index of Reports 1 to 14 and Circulars 1 to 41 (pp. 63–71).

[Report of the Indiana Station] department of entomology (*Indiana Sta. Rpt. 1924, pp. 23–26, figs. 3*).—In this brief general statement of entomological work during the year, experiments conducted cooperatively with the U. S. D. A. Bureau of Entomology at Vincennes are said to emphasize the value of the boiled oil emulsion in combating the San Jose scale. Oils emulsified with Bordeaux mixture, caseinite of lime, and other materials by the cold process and lime sulfur gave fairly good results, but not so good as the oil emulsion. It is pointed out that in an emergency the oil emulsion can be used as a summer spray on apple trees.

A deformity of peaches known as "cat faced" was found by B. A. Porter to be caused by the tarnished plant-bug, and not by the flower thrips. Two insects have been found to be implicated in the transmission of leaf roll and tomato mosaic.

[Work with economic insects at the New Mexico Station] (*New Mexico Sta. Rpt. 1924, pp. 19, 20*).—Experiments conducted show the use of oil sprays to be more efficient in the control of the San Jose scale than is lime sulfur. Ordinary waste engine oil emulsified with casol gave the best results of all the emulsions tried. The occurrence of the cabbage aphid and cotton bollworm is referred to, and it is reported that the alfalfa stem nematode, *Tylenchus dipsaci*, is the cause of a rotting of the stem bases and crowns of alfalfa plants in San Juan County.

Pest control work [at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 8–11, 12, 13*).—It is stated that about 53,084 acres of prairie dogs have been destroyed according to an act passed by the legislature, but that about 200,000 acres in the State still remain infested. The economic status of the crow in Oklahoma and its control are considered. It is estimated that the State has been boarding from 10 to 15 million crows during the winter for several years. A bulletin on the crow in Oklahoma has been noted (E. S. R., 42, p. 355). A brief reference is made to the boll weevil, green bug, and white ant. Protection of cows from flies is also considered.

Report of assistant entomologist, Vernon, M. H. RUHMANN (*Brit. Columbia Dept. Agr. Ann. Rpt., 18 (1923), pp. 43–48*).—This is a brief account of the occurrence of the more important insects of the year and control work conducted. Particular attention was given to the codling moth, which is slowly but surely spreading through all the interior fruit sections of British Columbia. In investigations of the fruit-tree leaf-roller, which has become a serious pest in the fruit-growing sections of the interior, excellent control was obtained from the use of Dormoil. It is pointed out that it must be applied during the dormant season and all egg masses covered.

"Two other leaf rollers, *Cacoecia rosaceana* and *Tortrix alleniana*, are also recorded in the interior, *C. rosaceana* being of considerable economic importance, and in the past season was nearly as destructive as *C. argyrospila*. Owing to a difference in the life history of these insects the dormant sprays are not effective in the control of *C. rosaceana*. Arsenical sprays must consequently be used where this insect is present."

Report of the division of entomology [of the Porto Rico Insular Station], fiscal year 1923–24, [G. N. WOLCOTT] (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1924, pp. 88–103; also in Spanish ed., pp. 101–107, 109–116*).—In control work with white grubs attacking sugar cane, the author was led by the results which Leach and Thompson obtained in work with the Japanese beetle (E. S. R., 49, p. 657) to experiment with carbon disulfide emulsion, and concludes that it is the cheapest effective remedy yet discovered. Ten, 8, and 6 cc. of the diluted emulsion per square foot of soil killed from 90 to 100 per cent of the grubs, and in one experiment 5 cc. also killed all of the grubs; but in a later experiment 5 cc. killed only 65 per cent, 4 cc. 40 per cent, and 3 cc. 25 per cent. Thus there appears to be no particular advantage to be gained from using more than 6 cc. of the emulsion, at a cost for materials alone of about $25 per acre. Large-scale experiments in its preparation and use in the field are considered desirable.

In work with the sugar-cane borer, the second most important enemy of sugar cane in Porto Rico, 19 per cent was the average infestation found in fields of Yellow Caledonia cane. The discovery that the so-called Cuban parasite, *Euzenilliopsis diatraea* Twns., is abundant in Porto Rico as well as in Cuba is recorded. In investigations in a field near Rio Piedras, H. E. Box, an entomologist from British Guiana, found 15 per cent of all sugar-cane borer larvae collected to be parasitized by this tachinid, while in the vicinity of

Bayamon 20 per cent were parasitized. In experimental work the large black and red wasp, *Ipobracon grenadensis* Ashm., was introduced by Box from British Guiana, where it parasitizes about 2 per cent of the sugar-cane borers.

The use, with considerable success, of a poison bait consisting of 1 lb. of meat and 1 or 2 oz. of cyanide per application for the control of the small red ant, or hormiguilla (*Myrmelachista ambigua ramulorum* Whlr.), considered by most growers to be the most destructive enemy of the coffee tree, is reported upon. One of the wireworms which has caused considerable damage to tobacco fields was successfully reared and proved to be *Aeolus elegans* Fab., and another to be *Monocrepidus bifoveatus* P. de B. The pink bollworm has continued to spread and is now present in all the island except a small central section. A record kept of the collection of adults of the banana rootborer from traps of freshly cut banana stems and corms shows that, while persistent collecting will hold down the numbers of the borer so that the injury is reduced to a minimum, it must be kept up continuously and form a permanent part of the plantation practice. A brief reference is made to experiments on the comparative resistance of woods to the attack of the termite *Cryptotermes brevis* Wlk., an account of which has been noted (E. S. R., 52, p. 657). Outbreaks of the grass looper caterpillars (*Mocis* (*Remigia*) *repanda* Fab.) occurred in all parts of the island, pastures and young cane being attacked. At about the same time the chinch bug, which has never before been known as a pest in Porto Rico, became very abundant in the northwest corner of the island. It is thought that the comparative scarcity of the common grass lizard, *Anolis pulchellus* D. & B., may be a factor contributing to chinch bug increase, although lack of rainfall is considered the principal factor. A microlepidopteran thought to belong to the genus Acrolophus was the source of injury to the roots of grasses in some of the mountain pastures near Gurabo.

Attempts by F. Sein, jr., to transmit mosaic disease to malojillo grass by means of *Aphis maidis* Fitch failed, *Echinochloa colona* being the only grass in which the disease was successfully inoculated.

Tests failed to substantiate the claim that the molasses grass, *Melinis minutiflora*, is toxic to the cattle tick.

[Annual reports of the entomologist of Kenya Colony for the years 1922 and 1923], T. J. Anderson (*Kenya Colony Dept. Agr. Ann. Rpts. 1922, pp. 105–110; 1923, pp. 63–80*).—These reports deal with the entomological work of the years 1922 and 1923, the second of which includes a list of insects of the year.

Social insects, M. S. Dunn (*Amer. Jour. Pharm., 96 (1924), No. 6, pp. 412–435, figs. 6*).—This account includes a bibliography of 25 titles.

Protection of seed wheat from insects, E. O. Essig (*Pan Pacific Ent., 1 (1924), No. 2, pp. 93, 94*).—The treatment of seed wheat for bunt with copper carbonate dust at the rate of 2 oz. per bushel is said to kill all the weevils and other insects and to prevent reinfestation.

[Insect enemies of the olive] (*Les Ravageurs de l'Olivier. Compte Rendu des Travaux du 6. Congrès International d'Oléiculture, Nice, 1923. Paris: Libr. Spécial Agricole, 1924, pp. [6]+211, pls. 10, figs. 9*).—Among the papers presented at the Sixth International Congress of Oleiculture, held at Nice in October, 1923, are the following: The Control Work with the Olive Fly (*Dacus oleae* R.) in Italy, by A. Berlese (pp. 35–47); The Present Status of Olive Fly Control, by F. Silvestri (pp. 48–77); In What Other Ways Can the Olive Fly Be Controlled? (pp. 84–89) and The Bacterial Diseases of the Olive Fly (pp. 90–95), both by G. del Guercio; Control Work with the Olive Fly in

Spain, by I. Agullo (pp. 96–116); The Application of Control Measures for the Olive Fly in Greece, by J. Sordina (pp. 117–151); Control Work with the Olive Fly in France, by R. Poutiers (pp. 152–158); The Insect Enemies of the Olive in Algeria, by Delassus (pp. 163–170); and [Olive Insects in Tunis], by Pagliano (pp. 174–178).

Insects attacking the olive [trans. title], L. NAVARRO (*In Las Enfermedades del Olivo. Madrid: Calpe, 1923, pp. 53–166, figs. 33*).—This gives a general account of the insect enemies of the olive and measures for their control. A brief account of *Phytoptus oleivorus* and its injury follows (pp. 163–166).

The effect of the venom of some supposedly poisonous arthropods, W. J. BAERG (*Ann. Ent. Soc. Amer., 17 (1924), No. 3, pp. 343–352, figs. 7*).—In this paper the author deals with centipedes (pp. 343–349) and scorpions (pp. 349–352), reporting experiments conducted on rats and man.

An interesting parasite of a praying mantid (Dip., Orth.), O. W. ROSEWALL (*Ent. News, 35 (1924), No. 10, pp. 370, 371*).—The author records the rearing of *Sarcophaga flavipes* Ald. from a female Carolina mantis collected at Baton Rouge, La., in October. Ten maggots are said to have emerged from the body of the mantid through an opening in the thin chitinous wall between two segments of the abdomen.

Aphididae of Formosa, I, II, R. TAKAHASHI (*Formosa [Taiwan] Govt. Agr. Dept. Expt. Sta. [Spec. Rpt. 20] (1921), pp. 97, pls. 14; Govt. Research Inst., Dept. Agr. Rpt. 4 (1923), pp. 173+3, pls. 9, figs. 4*).—The first part of this monographic account includes tables for the separation and descriptions of 98 species found in the island of Taiwan, 3 genera being erected and 44 species and 1 variety being described as new. In the second part a list of 29 additional forms collected since the publication of the first part is followed by a list of the Aphididae of Taiwan, which represent 47 genera (pp. 3–9); descriptions of 46 new or little-known Aphididae of Taiwan (pp. 10–57); descriptions of 9 new or little-known Japanese Aphididae (pp. 58–68); and field observations on some Aphididae in Taiwan and Japan (pp. 69–153). A list of ants collected that attend plant-lice (pp. 154, 155), a food plant catalogue of the Aphididae in Taiwan (pp. 156–173), and an index to the genera and species are included.

The Coccidae of Palestine, F. S. BODENHEIMER (*Zionist Organ. Inst. Agr. [etc.] Agr. Expt. Sta. Bul. 1 (1924), pp. [2]+100, pls. 12, figs. 48*).—This is a first report on the family, based upon a study of the scale insect fauna of Palestine extending over a period of one and one-half years, during which time 65 species have been discovered, of which 8 are described as new. In the first, or general part (pp. 3–22), the author deals with the history of exploration of the Coccidae of Palestine, the Coccidae of Palestine from the point of view of animal geography, the geographic position of Palestine (climate, character of the territory, frontiers), gall-producing Coccidae of Palestine, economically important Coccidae of Palestine, the natural enemies of the Coccidae of Palestine, methods of control, and native names of the scale insects. A key for the determination of the subfamilies and genera is included. The second, or special part (pp. 23–94) consists of a list of the Coccidae of Palestine with short descriptions, etc., and a list arranged according to the genera of plants attacked by them. Part 3 (pp. 95–100) consists of a bibliography of 20 titles.

Descriptions and biology of new or little-known coccids from Japan, I. KUWANA (*[Japan] Dept. Agr. and Com., Imp. Plant Quarantine Sta. Bul. 3 (1923), pp. 1–67, pls. 14, figs. 5*).—This paper consists of descriptions and notes on life history studies of some of the more important coccids attacking citrus trees in Japan, and a few others. Eight species are considered at length, of which three are described as new.

The yanone scale, *Prontaspis yanonensis* (Kuw.), is said to be the most injurious scale pest of oranges in Japan. It propagates very rapidly and attacks twigs, foliage, and fruit, killing the twigs, and in case of severe attack the entire tree dies. The red wax scale, *Ceroplastes rubens* (Mask.), is principally a citrus pest in Japan, having become established in the groves about Nagasaki and elsewhere some 10 years ago. *C. floridensis* Comst. and *C. ceriferus*, while not very important as compared with *C. rubens*, yet are often responsible for the infestation of the Japanese persimmon, tea plant, camellia, *Ilex othera*, etc., by the sooty mold fungus. *Geococcus citrinus* n. sp. attacks the roots of the Satsuma orange in Izu Peninsula, Shizuoka-ken. *G. oryzae* (Kuw.) occurs on the roots of upland rice about Yokkaichi, Miye-ken, and also on the roots of weeds at the Shizuoka-ken Agricultural Experiment Station. *Rhizoecus kondonis* n. sp. occurs on the roots of orange trees in Shizuoka-ken and at the Wakayama-ken Agricultural Experiment Station. *Orthezia yasushii* n. sp. occurs on wild chrysanthemum in Tsugumi-mura, Oita-ken, Kiushiu. A list of 45 references to the literature is included.

The tent caterpillar, R. E. Snodgrass (*Smithsn. Inst. Ann. Rpt. 1922, pp. 329–362, pl. 1, figs. 21*).—This is a report of observations and studies by the author, presented and illustrated in a popular manner. In addition to the life history of the eastern tent caterpillar, information is given on the structure and physiology of the caterpillar.

The mesquite cutworm, Melipotis indomita Walker, H. R. Brisley (*Pan-Pacific Ent., 1 (1924), No. 2, p. 94*).—The author observed injury by this pest to mesquite bordering the Verde River, where for a distance of 20 miles the trees were practically without leaves up to June 1, and also injury in the Salt River Valley near Phoenix, Ariz. Its occurrence in the Sulphur Springs Valley near Douglas, Ariz., is also recorded.

Paradichlorobenzene (*Miss. State Plant Bd. Quart. Bul., 4 (1924), No. 2, pp. 43, 44*).—It is pointed out that recent experiments in Georgia by Snapp (E. S. R., 51, p. 362) show that there is considerable danger in using paradichlorobenzene on 3-year-old trees, and its use is now advised only for trees 4 years of age and older.

The control of the pink bollworm (Platyedra gossypiella Saunders) in the Sudan, H. H. King and W. E. Giffard (*Wellcome Trop. Research Labs., Ent. Sect. Bul. 21 (1924), pp. 16, pl. 1*).—The author concludes that the control of the pink bollworm lies in the protection of the crop from infestation. This can be effected by "(1) the destruction of the old cotton plants and refuse of the crop when the last picking has been taken, and at the same time of all other plants on which this insect can feed, (2) the export from the district of all seed resulting from the crop, except such as may be required for sowing, which should be sunned or otherwise treated for the destruction of pink bollworm contained in it, (3) the observance of a dead season of two months between the destruction of the remnants of the old crop and the sowing of the new, and (4) the use of none but clean seed for sowing." Where this procedure has been followed in the Sudan the pink bollworm is said to have been completely controlled.

A cypress moth, E. O. Essig (*Pan-Pacific Ent., 1 (1924), No. 2, p. 93*).—The small brown pyralid moth *Herculia phoezalis* Dyar has been taken by the author in destructive numbers on Monterey cypress at San Diego, Calif.

The cherry maggots, R. H. Pettit (*Michigan Sta. Circ. 67 (1925), pp. 2, fig. 1*).—This is a brief popular summary of information on the cherry fruit-fly, of which there are said to be two forms in Michigan, the white-banded cherry fruit-fly and the black-bodied cherry fruit-fly. The maggots of both infest

sour cherries and occasionally, to a less degree, late varieties of sweet cherries, notably Dikeman.

Studies of dipterous parasites: The primary larvae of Tachinidae of the group Echinomyiinae [trans. title], W. R. THOMPSON (*Min. Agr. [France], Ann. Épiphyties, 9 (1923), No. 3, pp. 137–201, pls. 12*).—The author concludes that by using the characters of the primary larva as a basis one can describe and identify the species of tachinid parasites. It is, however, difficult or even impossible to separate the first stage larvae of some species that are readily distinguished in the adult stage. On the other hand, as the author has shown for other groups of tachinids (E. S. R., 47, p. 555), it may be difficult or impossible to separate some species in the adult stage that are readily distinguishable in the first larval stage.

Blowfly of sheep and allied conditions affecting stock, or "calliphorine myiasis" in domesticated animals, H. H. CURSON (*Union So. Africa Dept. Agr. Jour., 9 (1924), No. 3, pp. 266–274*).—This is a discussion of the subject in connection with a list of 15 references to the literature.

The natural spread of the Colorado potato beetle in France in 1923 [trans. title], J. FEYTAUD (*Rev. Zool. Agr. et Appl., 23 (1924), No. 8, pp. 177–182, fig. 1*).—This account of the spread of the potato beetle in 1923 supplements earlier accounts of the pest in France (E. S. R., 50, p. 758). Attention is called to the fact that the advance of the beetle up to June, 1923, was about 140 km. (86.94 miles) beyond the points reached the preceding June, or about the distance reported by Riley as having been attained annually in its eastward spread in the United States.

Diabrotica tricincta Say injurious in New Mexico, F. H. CHITTENDEN (*Bul. Brooklyn Ent. Soc., 19 (1924), No. 5, pp. 184, 185*).—The author records serious injury by this beetle to truck crops, including beans, squash, cucumber, cantaloupe, watermelons, and other crops, in the vicinity of Tucumcari, N. Mex., in July, 1923. This is the first instance of serious injury by it known to the author. The species occurs in Colorado, Arizona, and New Mexico.

The possibilities of weevil development in neglected seeds in warehouses, A. O. LARSON and C. K. FISHER (*Jour. Econ. Ent., 17 (1924), No. 6, pp. 632–637, fig. 1*).—The experiments reported show that several broods of weevils may develop in a small lot of seeds. Most of these fly away in search of new material on which to oviposit, but enough remain in the original seed to keep up the infestation until practically all the available food has been removed.

The amaranth curculio, Conotrachelus seniculus Lec., F. H. CHITTENDEN (*Jour. N. Y. Ent. Soc., 32 (1924), No. 3, pp. 119–121*).—This is a report of studies of *C. seniculus*, which, by its attack upon the main roots, kills cultivated amaranth grown in the vicinity of Washington, D. C.

The elm leaf beetle in California, E. O. ESSIG (*Pan-Pacific Ent., 1 (1924), No. 2, p. 93*).—The author reports that the elm leaf beetle has made its first appearance in California, having become firmly established in the city of Fresno. In August, 1924, large and small elms on about 80 blocks in that city were found infested, many trees being completely defoliated, some having put out new growth and been defoliated three times.

Alkaline reaction of the cotton plant, F. B. POWER and V. K. CHESNUT (*Science, 60 (1924), No. 1557, p. 405*).—Investigations conducted by the U. S. D. A. Bureaus of Chemistry and Entomology, cooperating, have led the authors to conclude that the alkalinity of the dew of the cotton plant is attributable, at least in part, to the presence of ammonia and trimethylamine. It has been ascertained that trimethylamine has a particular attraction for the boll weevil.

Studies on the honey bee, with special reference to the Japanese honey bee, Y. Tokuda (*Sapporo Nat. Hist. Soc. Trans., 9 (1924), No. 1, pp. 1–27, pls. 2*).—The first part of this account of *Apis mellifica japonica* deals with its morphological characteristics (pp. 4–12) and the second part with its biological characteristics (pp. 12–18). The paper includes a list of 28 references to the literature.

Wintering bees in Colorado, R. G. Richmond (*Colo. State Ent. Circ. 45 (1924), pp. 12, figs. 9*).—This is a practical discussion as applied to Colorado conditions.

The ants of Timothy Thümmel, A. Ferenczy (*London: Jonathan Cape Ltd., 1924, pp. 320, figs. 5*).—This is a popular account based upon the writings and notes of T. Thümmel, a Hungarian zoologist. Notes on the social life of ants, with references to the literature, compiled by the author with the assistance of E. L. Cheesman and revised by H. Donisthorpe (pp. 259–320), are included.

Observations on the hymenopterous parasites of Ceroplastes rubens Mask., with descriptions of new genera and species of the subfamily Encyrtinae, T. Ishii (*[Japan] Dept. Agr. and Com., Imp. Plant Quarantine Sta. Bul. 3 (1923), pp. 69–114, pls. 5*).—The author deals with the life histories and bionomics of *Microterys speciosus* n. sp. and *Coccophagus lecanii* Fitch, which are rather common parasites of *C. rubens*, an introduced coccid that has caused great damage to citrus in Japan. *M. speciosus*, while rather common, effects the parasitism of only about 3 per cent of the host scales. *C. lecanii* is very frequently met with, and parasitizes 13.5 per cent in the third and 12.6 per cent in the fourth generation. This scale is also parasitized in Japan by *Cheiloneurus ceroplastis* n. sp., and *Perissopterous mexicanus* How., two species rarely met with.

The genera Clausenia and Neocopidosoma are erected, and seven species belonging to the subfamily Encyrtinae, collected in the vicinity of Nagasaki, are described as new. A list of 26 references to the literature is included.

The identity of Nemicromelus fulvipes (Forbes), a common Hessian fly parasite (Hymenoptera), P. R. Myers (*Ent. Soc. Wash. Proc., 26 (1924), No. 9, pp. 222–224*).—A contribution from the U. S. D. A. Bureau of Entomology, in which the author deals with the synonymy of this parasite of the Hessian fly.

A blowfly and some parasites, G. H. Hardy (*Queensland Agr. Jour., 22 (1924), No. 5, pp. 349, 350*).—This account is based upon investigations of parasitism of the common blue-green Lucilia or bluebottle fly, which is one of the worst pests the stock owner has to contend with in Queensland. The parasites studied, three in number, which belong to the genera Mormoniella (better known under the name Nasonia), Paraspilomicrus, and Tachinaephagus (also called Australeucyrtus), are all doing valuable work in reducing blowflies and houseflies.

FOODS—HUMAN NUTRITION

Final report of the departmental committee on the use of preservatives and colouring matters in food, H. C. Monro et al. (*London: Min. Health, 1924, pp. 84; rev. in Edinb. Rev., 241 (1925), No. 491, pp. 139–152*).—This is the final report of a committee appointed in 1923 by the Ministry of Health of Great Britain to determine whether the use of certain preservatives and coloring materials in food is injurious to health and, if such materials are allowed, whether it should be required that their presence be declared.

The subject matter of the report consists of a preliminary survey of the conditions existing in Great Britain at the time the investigation was undertaken, including a summary of a report made in 1901 by a similar committee (E. S. R.,

upon the testimony of a large number of witnesses of the relative harmlessness of various preservatives; a discussion of the extent to which preservatives can be dispensed with in particular food products; and brief sections on various problems connected with the use of preservatives, preservation by cold, the use of coloring matter, amendments of the law, etc. The principal recommendations are as follows:

Preservatives as a whole should be prohibited in all articles of food and drink offered for sale, whether manufactured in the country or imported, with the exception of sulfur dioxide and benzoic acid in certain specified amounts for various food products. It is recommended that the amount and nature of these preservatives be indicated on the label.

Existing laws in the United States and various other countries concerning the use of preservatives and coloring matter are summarized in appendixes.

Effect of water containing free chlorine in bread making, C. B. Morison (*Cereal Chem., 1 (1924), No. 5, pp. 267–272*).—The results of uniform baking tests with ingredients varying only in the amount of free chlorine in the water are reported and indicate that the presence of from 5 to 10 parts of free chlorine per million has no deleterious effect on bread quality. Since these amounts are from 12 to 25 times the maximum amount of residual chlorine that has been found in the Chicago water supply, complaints that the chlorination of water in that city is detrimental to the quality of bread prepared with it would seem to be unfouuded.

The fermentation power of fresh yeast was also found to be unaffected by the presence of 5 parts per million of chlorine in the water.

Basal metabolism before and after exposure to high temperatures and various humidities, W. J. McConnell and C. P. Yagloglou (*Pub. Health Rpts. [U. S.], 39 (1924), No. 49, pp. 3075–3088, figs. 6*).—In this investigation, conducted by the authors with the assistance of W. B. Fulton, the temperatures employed were calculated as effective temperatures, this term being defined as "an index of the intensity of heat felt by the human body as a result of external temperature, humidity, and air movement."

The greater part of the data reported was obtained on two subjects according to the usual technique for basal metabolism determinations. The samples of air were collected in a special gasometer constructed at the U. S. Bureau of Mines. About 60 liters of expired air was collected from the subject in each sample, and from this an average sample was analyzed in a Haldane apparatus for CO_2 and O_2. The effective temperature in each case was calculated from wet and dry bulb readings. From the data thus collected, the following conclusions were drawn:

"Carbon dioxide produced and oxygen consumed increase with exposure to high and low temperature. Heat production increases with exposure to high and low temperature. There is a zone of minimum metabolism between 75° and 83°, effective temperatures within which basal metabolism should be measured. The metabolic rate becomes excessive when the temperature of the environment exceeds the body temperature."

Mineral elements in nutrition with special reference to calcium and phosphorus, H. C. Sherman et al. (*Amer. Jour. Pub. Health, 14 (1924), No. 6, pp. 513–517*).—This report of the committee on nutritional problems of the American Public Health Association deals with the requirements of the human body for calcium and phosphorus and the importance of these elements as factors in nutrition and health.

Iron deficiency and its possible relationship to human disease, J. P. McGowan (*Lancet [London], 1924, II, No. 21, pp. 1060, 1061*).—This is a gen-

eral discussion of the possible bearing of some of the results obtained in the author's studies of iron deficiency in pigs (E. S. R., 52, p. 271) to human pathology, including chlorosis, rickets, and wet beriberi.

A further note on the value of egg-white as the sole source of nitrogen for young growing rats, M. A. Boas (*Biochem. Jour., 18 (1924), No. 6, p. 1322*).—It is reported briefly that, contrary to the unfavorable results previously reported for commercial dried egg-white of Chinese origin as a sole source of nitrogen for young rats (E. S. R., 51, p. 862), the whites of fresh hens' eggs are adequate for growth and health, thus confirming the conclusions of Osborne and Mendel as to the nutritive value of egg albumin (E. S. R., 33, p. 262). No conclusions have as yet been drawn concerning the cause of the failure following the use of the dried egg-white.

The banana as an accessory food [trans. title], E. Sopp (*Norsk Mag. Laegevidensk., 85 (1924), No. 9, pp. 732–735, figs. 2; abs. in Lancet [London], 1924, II, No. 18, p. 923*).—This paper reports the results of a study of the vitamin A content of bananas.

About 25 young rats, weighing from 30 to 40 gm. each, were placed on a vitamin A-free diet until most of them showed marked signs of ophthalmia. The animals were then divided into three groups, one of which received in addition to the basal diet bananas ad libitum and the other two 1 and 2 gm., respectively, of banana daily. All of the groups resumed growth at the normal rate and improved in general condition.

Water-soluble vitamine and bacterial growth, S. Hosoya and M. Kuroya (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 2 (1923), pp. 233–285, fig. 1*).—An extensive investigation of the relation of water-soluble vitamin to bacterial growth is reported in two papers, the first dealing with the general relationship of this vitamin to bacterial growth and the second with the physical and chemical properties of the vitamin, using the growth of hemolytic streptococci as the criterion of activity.

The vitamin preparations used were an aqueous extract of yeast, two oryzanin preparations, and the substance isolated by Tsukiye[2] from the phosphotungstic acid precipitate of an alcoholic extract of bran by the action of silver nitrate and baryta. Most of the experiments were conducted with the Tsukiye vitamin preparation. Four media were employed—routine broth autoclaved in neutral reaction at 140° C. for two hours and adjusted to pH 6.8 to 7, using phenol red and bromothymol blue; routine broth heated at 100° for one hour with the addition of N NaOH to N/10 alkalinity and adjusted to pH 6.8 to 7 as N HCl; and two protein-free synthetic media, Uschinsky's solution and Fraenkel's solution, both adjusted to pH 6.8 to 7. Care was taken not to carry over in the inoculation of the media traces of autolyzed cells or of the routine medium used for the original inoculation. The conclusions drawn are based chiefly on the growth of the bacteria tested in one of the synthetic media with the Tsukiye vitamin preparation.

It was found that some of the bacteria examined were capable of growing without the vitamin preparation, although growth was in most cases stimulated by its presence, and that for others the addition of the vitamin was absolutely essential for growth. To the first class belong the meningococcus, *Bacillus diphtheriae*, *Staphylococcus aureus* and *S. citreus*, *B. typhosus*, *B. paratyphosus* A, *B. dysenteriae*, *B. coli communis*, *Vibrio cholerae*, *B. pyocyaneus*, *B. anthracis*, *B. tetani*, *B. oedematis maligni*, and *B. capsulatus welchii*, and to the second *Streptococcus hemolyticus* and pneumococcus. With these organisms the

[2] Biochem. Ztschr., 131 (1922), No. 1–2, pp. 124–139.

substitution of various amino acids and sodium nucleate, indol, creatine, and urea was without effect.

A preliminary study of the stability of the vitamin showed it to be stable when heated in neutral solution at 140° at a pressure of 3.5 atmospheres for two hours.

The second paper reports a study of the physical and chemical properties of the organic substance in the Tsukiye vitamin preparation which is essential to the growth of hemolytic streptococci, and a comparison of these properties with those of the antineuritic vitamin and vitamin D or bios.

The activity of the vitamin as regards growth of hemolytic streptococci was destroyed by autoclaving at from 182 to 185° for two hours, but not at 162° for the same length of time. It proved to be easily adsorbed from neutral aqueous solutions by both fuller's earth and animal charcoal. In the presence of N/40 NaOH it was easily destroyed by heating at 100° for two hours.

In similar tests using yeast in place of hemolytic streptococci, it was found that the substance in the vitamin preparation which is essential for yeast growth was not destroyed by treatment with N NaOH or N HCl even if exposed to a temperature of 140° and pressure of 3.5 atmospheres for two hours, and in neutral solution was not destroyed by autoclaving at 160 to 162° or 182 to 185° for two hours. It was adsorbed readily by animal charcoal but not to any extent by fuller's earth.

The antineuritic factor present in the vitamin preparation was found to be unstable in neutral solution when autoclaved at a temperature of 140° for two hours.

In discussing the difference in properties of the factor required for the growth of hemolytic streptococci, the yeast growth stimulant, and the antineuritic factor, three possible explanations are suggested: (1) That the three factors may be the same substance, the difference being simply the dose required by each kind of organism, (2) that the vitamin may be a single substance consisting of different parts utilized in different ways by bacteria, yeast, and the pigeon, and (3) that the three factors may be of entirely different chemical nature. In the opinion of the authors, the third explanation is the most plausible. It is suggested that the yeast is capable of utilizing the simplest and most stable form, the hemolytic streptococcus a less stable, and the pigeon the least stable form.

The synthesis of the water-soluble vitamine by coli bacillus grown on synthetic medium, M. KUBOYA and S. HOSOYA (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 2 (1923), pp. 287–304, figs. 7*).—In this paper evidence is presented that *Bacillus coli* is capable of synthesizing the three factors present in the Tsukiye vitamin as described above.

A pure strain of *B. coli* was grown for 70 generations on one of the synthetic media used in the above study and finally for three days on a synthetic agar medium. The culture thus obtained was emulsified in distilled water, allowed to autolyze for one week at 37° C., and extracted with 70 per cent alcohol at from 85 to 90° for four hours in the water bath. The resulting extract after concentration was used as the source of vitamin for the growth of hemolytic streptococci, yeast, and rats, and in curative tests for pigeons, with positive results in all cases. As a source of vitamin for the growth of streptococci, the material showed the same properties as the factor contained in the Tsukiye vitamin.

It is concluded that *B. coli* is able to synthesize vitamin D or bios, the streptococcus vitamin, and vitamin B.

Vitamin B and lactation, G. A. HARTWELL (*Lancet [London], 1924, II, No. 19, pp. 956–958, figs. 2*).—This paper reports further evidence that more vitamin

B is required by the rat for successful lactation than for any other period of life (E. S. R., 48, p. 861). In the experiments reported, three diets were used, the first furnishing 22 per cent of protein, 12 per cent of fat, and 66 per cent of carbohydrate, the second even more protein, and the third similar to the first except that the protein was of low biological value. That the diets furnished sufficient vitamins for ordinary requirements was shown by growth at normal rate and reproduction of the females on the diet. None of the young, however, survived. When the second litters were born, some of the animals were changed to a diet of bread and milk and others received tomato juice as a source of vitamin B. In both cases the young were successfully reared.

In commenting upon these results, the importance is emphasized of including an abundance of vitamin B-containing foods in the diets of nursing mothers.

Contribution to the biochemistry of avitaminoses, I–IV [trans. title] (*Biochem. Ztschr., 152 (1924), Nos. 3–4, pp. 228–245, fig 1; 5–6, pp. 373–387, figs. 2; 420–425; 153 (1924), No. 1–2, pp. 86–96*).—This study of metabolism in experimental scurvy is presented in four papers as follows:

I, *Carbohydrate metabolism in experimental scurvy*, A. Palladin.—In this study guinea pigs weighing not less than 350 gm. were fed a ration of oats, turnips, and water and determinations made at 3-day intervals of the content of glucose and amylase in the blood and glycogen in the liver. The animals were then fed oats and boiled water and the blood analyses continued as before until the last stages of scurvy.

The glucose content of the blood of the animals on the first ration varied between 0.092 and 0.104 per cent. The change to the scorbutic ration was followed by a rise in the sugar content to a maximum of from 0.19 to 0.229 per cent on from the ninth to the fifteenth day of scurvy. This hyperglycemia was then followed by hypoglycemia with values as low as from 0.05 to 0.035 per cent, the hypoglycemia continuing until the death of the animals. In no case was the hyperglycemia accompanied by an increase in the sugar content of the urine.

These results are compared with a similar study by Collazo (E. S. R., 49, p. 566), in which the conclusion was drawn that in the development of scurvy there was first hypoglycemia, followed by hyperglycemia, and finally by hypoglycemia. The difference is attributed to the difference in the age of the animals, those of Collazo being much smaller at the beginning of the experiment. In the present study the loss of weight was delayed much longer than in the experiments of Collazo and was not evident until after the period of hyperglycemia.

The amylase content of the blood was found to alter in the same direction as the sugar content and the glycogen content of the liver to decrease gradually with the development of scurvy.

II, *Nitrogen metabolism (especially creatine metabolism) in experimental scurvy*, A. Palladin and A. Kudrjawzewa.—As in the previous study, fully grown guinea pigs were used as experimental animals. The normal ration consisted of oats and turnips and the scorbutic of oats and cooked turnip juice or oats and turnips which had been heated for an hour in the autoclave at 120° C. The urine was collected and analyses made on 2-day samples for total nitrogen, ammonia, creatinine, and creatine. Determinations were also made of the creatine content of the muscles and calculations of the creatinine coefficient in normal and scorbutic guinea pigs.

During the course of scurvy the total amount of urine nitrogen decreased. Calculated per kilogram of body weight, there was a gradual but insignificant decrease until just before death, when there was a sharp increase. The ammonia, on the other hand, showed a tendency to increase, this being partic-

larly marked when calculated in percentage of total nitrogen. The excretion of creatinine was only slightly altered. Creatine, which is not present in the urine of normal adult guinea pigs, appeared on the third or fourth day on the scorbutic ration and increased in amount with the progress of scurvy. The creatine content of the muscles was found to increase steadily during the course of scurvy.

III, *Blood enzymes in experimental scurvy*, P. Normark.—Determinations of the catalase, protease, peroxidase, and esterase content of the blood of normal and scorbutic guinea pigs are reported with the following results:

In the first few days of scurvy, there was a slight increase in catalase. The protease and esterase remained normal until the middle or end of the third week, and then, with the onset of severe symptoms of scurvy, the protease increased in amount and the esterase decreased. Peroxidase showed a slight decrease, followed by an increase to normal. In none of these enzymes was there as marked a change as in the amylase noted in the first paper. This is thought to indicate that the carbohydrate metabolism is chiefly affected by lack of vitamin C.

IV, *Calcium elimination and blood calcium in experimental scurvy*, A. Palladin and E. Ssawron.—The metabolism of calcium, as indicated by its output in the feces and urine and content in the blood, was found to be only slightly affected by scurvy. At the beginning of the third week, or occasionally earlier, there was a decrease in the calcium output both in the feces and urine and also in the calcium content of the blood, but these changes are considered to be due to the lowered intake following loss of appetite at about this time.

Antiscorbutic potency of whole-milk powder, G. W. Cavanaugh, R. A. Dutcher, and J. S. Hall (*Indus. and Engin. Chem., 16 (1924), No. 10, pp. 1070–1073, figs. 2*).—This is a complete report of an investigation which has been noted from a preliminary report (E. S. R., 50, p. 564). Dried milk prepared by a spray process in which the milk was evaporated in a continuous steel vacuum evaporator through which the milk passed in a very short time was found to have lost none of its antiscorbutic properties. Powdered citrus fruit juices prepared by the same process were also found to be as strongly antiscorbutic as the fresh juice. The lack of destruction of vitamin C is attributed to the rapidity of the drying process and the comparative absence of moisture.

The occurrence of gastric lesions in rats.—Their relation to dietary deficiency and hair ingestion, A. M. Pappenheimer and L. D. Larimore (*Jour. Expt. Med., 40 (1924), No. 6, pp. 719–732, pls. 4*).—The authors, with the assistance of R. Solley and Y. Kneeland, jr., have extended their observations on the relation of gastric lesions in rats to dietary deficiency (E. S. R., 51, p. 369).

A brief description, with illustrations, is first given of the normal structure of the nonglandular portion of the rat stomach and of the lesions observed in rats on deficient diets. As was noted in the preliminary report, the lesions occur chiefly on artificial and deficient diets. In the entire series of rats on deficient diets, lesions were encountered in 68 out of 112 rats, an incidence of approximately 61 per cent, while in 66 rats on supposedly complete diets, lesions were found in only 5 cases or approximately 7 per cent. The highest incidence of lesions was in a group of rats on the rickets-producing diet 84. Of 35 young rats which had been on this diet for from 27 to 35 days, 31 showed gastric lesions of greater or less severity. This number included 6 which had been prevented from rickets by daily exposure to the rays of the quartz mercury vapor lamp. Improving this diet by mineral supplements, including phos-

phorus, did not prevent the appearance of gastric lesions. It was also found that the lesions could not be attributed to the alkalinity or acidity of the diet per se.

A further study of the effect of cod liver oil in preventing lesions, as noted in the preliminary report, showed that this effect could not be attributed to the vitamin A content of the oil, for oil oxidized to the point of complete loss of antiophthalmic property was still effective in preventing lesions on a diet complete except for vitamin A. When cod liver oil was used as the supplement to diet 84 to the extent of 2 per cent of the ration, lesions occurred.

The finding of hair fragments embedded in the ulcers in many cases suggested the possibility of ingested hair being an important factor in the production of lesions. To test this, cut rat hair was incorporated in a diet adequate for rats and this diet was fed to 6 young rats, while 6 controls were given the same diet without the hair. Lesions were noted in the stomachs of 2 of the rats of the first group, while none were found in the controls.

In commenting upon these results, the opinion is advanced that deficient diets undoubtedly favor the occurrence of gastric lesions, but as to the precise nature of the dietary influence the evidence thus far is considered inconclusive. Ingested hair is thought to be an important factor, but whether the hair acts merely as a mechanical irritant or as the carrier of an infective agent has not been determined. "It is probable, moreover, that the deficient diets in some way that we do not as yet understand, intensify the injury caused by the hair. However produced, the lesions are so frequently found that they should be taken into account in experimental work on rats, especially in judging of the effects of dietary influences by the weight curves. That the presence of severe ulcerative lesions in the prostomach must unfavorably affect the general nutrition of an experimental animal seems beyond question."

The rôle of the liver in the mechanism of the hypoglycemic action of insulin in the normal animal [trans. title], H. Simonnet (*Bul. Soc. Chim. Biol., 6 (1924), No. 8, pp. 742–758, figs. 3*).—In this investigation of the possible rôle of the liver in the action of insulin, a comparison was first made of the extent of the lowering of the blood sugar of rabbits following the injection of insulin in the portal vein or in the general venous circulation. From the results of three experiments it was concluded that the action of the insulin is slightly more marked and prolonged when the insulin is injected in the mesentery than in a vein of the general circulation.

A comparison was then made of the content of sugar in the subhepatic vein and in the arterial blood of dogs during the course of insulin hypoglycemia. In the first animal the content of sugar in the subhepatic vein was higher than in the carotid artery following the injection of insulin, and in the second about the same but not lower. This is thought to indicate that in insulin hypoglycemia glycogenolysis is not interfered with.

Finally, the effect upon insulin hypoglycemia of the removal of the liver was studied in frogs after preliminary experiments had shown that these animals were suitable for such a study. The removal of the liver instead of lowering the action of the insulin was found to accentuate it.

It is concluded that the liver does not play an active rôle in the mechanism of the action of insulin in normal animals.

A certified milk-borne paratyphoid outbreak, H. Williams (*Jour. Amer. Med. Assoc., 84 (1925), No. 4, pp. 251–253, fig. 1*).—A brief account is given of an outbreak of paratyphoid fever occurring among about 60 babies and young children in New Rochelle, N. Y., and neighboring communities. The outbreak was definitely traced to a carrier of *Bacillus paratyphosus* B, who was a milker

ANIMAL PRODUCTION

Animal grafts: Their practical utility for animals, S. Voronoff (*Greffe Animale. Ses Applications Utilitaires au Cheptel. Paris: Libr. Octave Doin, 1925, pp. 100, figs. 59*).—The results brought about by grafting endocrine organs on various animals in certain experiments are briefly reviewed, and the application of such methods to livestock is pointed out. The surgical procedure to be followed in carrying out these operations is carefully described.

Monthly ratio of births and slaughter of food animals, J. Roberts (*Cattleman, 11 (1924), No. 4, pp. 35, 37*).—The relations of the monthly slaughterings of cattle, hogs, and sheep to the births of these animals during the last 10 years are tabulated. It is shown that 49.6 per cent of the cattle, 52.8 per cent of the pigs, and 76.3 per cent of the lambs were born during March, April, and May. The births of cattle were most uniformly distributed over the year, while 96.7 per cent of the lambs were born in the first 6 months. The monthly slaughterings of the animals were more even, though the hog slaughterings dropped very low in May, June, July, and August.

Proceedings of the twenty-seventh annual convention of the American National Live Stock Association (*Amer. Natl. Livestock Assoc. Proc., 27 (1924), pp. 198, pls. 7*).—This is the usual report of the annual meeting of this association (E. S. R., 50, p. 268) held at Omaha, January 15–17, 1924, including many papers of popular interest.

The exploitation of colonial livestock [trans. title], A. d'Hubert (*Ann. Inst. Natl. Agron., 18 (1924), pp. 52–204, figs. 37*).—The production and the consumption of meat in France are reviewed statistically, followed by separate accounts of the numbers and quality of the meat-producing animals in the French colonies. A portion of the article deals with different methods of exporting meat, i. e., on foot, refrigeration, salting, drying, etc.

Levels of nutrition, D. W. Steuart (*Scot. Jour. Agr., 7 (1924), No. 1, pp. 83–86*).—Based on the results of fattening experiments with swine, cattle, sheep, and poultry of various sizes conducted by other investigators, the author has shown that the food requirements of fattening animals of the same kind are proportional to their surface area irrespective of their live weight.

The effect of mineral supplements on growth and reproduction, W. D. Salmon (*Science, 60 (1924), No. 1559, p. 457*).—The effect on growth and reproduction in the albino rat of the addition of certain minerals to a basal ration of 2 parts of yellow corn and 1 part of peanut meal was investigated at the Alabama Experiment Station.

None of the animals receiving the basal ration alone or with the addition of 1 per cent NaCl showed signs of pregnancy, and growth on the former ration was slight, while gains on the latter ration did not occur after from 2 to 3 months of feeding. Normal growth was made when 1.5 per cent of $CaCO_3$, steamed bone meal, or acid phosphate were added with the NaCl as a supplement. Young were produced even to the fourth generation when steamed bone meal was supplied, but the third and fourth generations were not normal. With $CaCO_3$ the young produced after the first litter did not grow rapidly, and the third generation failed. With acid phosphate the young, though produced fairly regularly, were small, low in vitality, and usually died soon after birth.

[The vitamin requirements of animals] (*Indiana Sta. Rpt. 1924, pp. 35, 36*).—In studying the vitamin requirements of pigs, the first 5 months' results have indicated that young pigs lose weight and develop rickets on rations deficient in the fat-soluble vitamins, but no apparent abnormalities were shown

on rations deficient in vitamin B. Malnutrition developed on rations deficient in vitamin C.

Both commercial tankage and tankage prepared by the veterinary department were found to be deficient in vitamins, which is thought to be due to the high temperature encountered in manufacture. Fowls and albino rats fed on high protein diets have been found to require a larger amount of vitamin B for protection against the deficiency effects than when fed on low protein diets.

A bibliography of researches bearing on the composition and nutritive value of corn and corn products, M. H. Keith (*Illinois Sta. Bull. 257 (1925), pp. 151*).—In this revision (E. S. R., 44, p. 71), more than 400 new references have been added.

Digestibility of darso silage (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 16, 17*).—Chemical studies of darso silage have shown that during the ensiling process one-half of the protein becomes water soluble. This portion exists as 18 per cent ammonia, 17 per cent humus, 62.5 per cent amino acids, and 2.5 per cent unknown. The process thus aids digestion, but the acidity developed is detrimental to it. When using sheep, the digestibility of the constituents of darso silage was found to be as follows: Dry matter 63.7 per cent, protein 30, fat 67.9, nitrogen-free extract 74, fiber 42, and ash 18.1 per cent. Silage having 75 per cent of the acidity neutralized by calcium carbonate was found to have the following digestibility: Dry matter 55.5 per cent, protein 12.3, fat 74.5, nitrogen-free extract 69.4, fiber 35.5, and ash 12.4 per cent. It is suggested that the lime has had an inhibiting effect on enzyme activity.

Electrically preserved fodder: Basis of fresh preservation of succulent feeds with electricity; construction, operation, and economy of electrical silage plants, H. Osten (*Elektrofutter. Grundlagen der Frischhaltung von Saftfutter durch Elektrizität. Bau, Betrieb und Wirtschaftlichkeit von Elektro-Siloanlagen. Charlottenburg, Germany: Rom-Verlag (R. Otto Mittelbach), 1923, pp. 102, figs. 28*).—A monograph on the preservation of succulent feeds by electricity, dealing with the methods employed and value of the product as compared with fermented silage.

Saving livestock from starvation on southwestern ranges, C. L. Forsling (*U. S. Dept. Agr., Farmers' Bul. 1428 (1924), pp. II+22, figs. 15*).—This consists of pertinent suggestions for the prevention of heavy losses on the ranges of the Southwest during droughts. Overstocking is a main cause of these losses. The author states that the breeding herds should be limited to the carrying capacity of the range during drought and that the balance should consist of surplus cattle that can be readily disposed of in an emergency. It is suggested that supplemental feeds be available for use when necessary, cottonseed products and dry land forage crops being especially mentioned. Sheep may be more quickly adapted to changes in climatic conditions than cattle.

Cost and methods of carrying cattle on national forest ranges in Colorado, Wyoming, Montana, Utah, and Idaho, 1923, G. S. Klemmedson (*Cattleman, 11 (1924), No. 4, pp. 25, 27–29, 31*).—This is the report of a study of the cost and methods of carrying cattle on national forest ranges, based on records of 34,265 cattle on 138 ranches and of 39,072 cattle in 24 cattle pools in Colorado, Utah, Wyoming, Idaho, and Montana.

Cooperative grazing experiment, J. T. Sarvis (*U. S. Dept. Agr. Bul. 1301 (1925), pp. 70–79, figs. 4*).—The results of grazing experiments conducted cooperatively by the Office of Dry-Land Agriculture Investigations of the Bureau of Plant Industry and the North Dakota Agricultural College from 1916 to 1922 are briefly reported. In studying the carrying capacity of the pastures,

lots of 10 2-year-old steers were run in 100-, 70-, 50-, and 30-acre pastures each year and the comparative gains determined.

The conclusions from the combined 7 years' experiments indicated that the 100-acre pasture was too large, since it was undergrazed, and the 70-acre pasture better met the requirements for continuous grazing. The 50-acre pasture was overgrazed, and the 30-acre pasture was severely overgrazed, the cattle not being carried for 5 months, though in the latter case the largest gain per acre was produced. The development of unpalatable plants has occurred in the pastures which were overgrazed.

Other experiments begun in 1917 have included a test of a rotation pasture of 70 acres, which was divided into three portions. The results of this investigation so far have indicated that the carrying capacity is approximately 4,375 acres per head. The plan for pasturing the rotation pasture is outlined in detail, and the gains made on the pastures of varying sizes during each of the years are also tabulated.

The results of a study of the native vegetation are also briefly noted from a more complete account in an earlier publication (E. S. R., 49, p. 865).

Fattening yearling steers (*New Mexico Sta. Rpt. 1924, p. 36*).—In cooperative experiments with the U. S. D. A. Bureau of Animal Industry and the Office of Dry-Land Agriculture Investigations, cottonseed meal and cowpea hay and sorghum hay and sorghum silage were compared for fattening lots of 9 or 10 yearling steers when fed with ground milo.

The results of these experiments showed that for one lot the average daily gains per head were 1.77 lbs., requiring 638 lbs. of ground milo, 107 lbs. of cottonseed meal, and 641 lbs. of sorghum hay per 100 lbs. of gain. Another lot made an average gain of 1.71 lbs. and required 674 lbs. of ground milo, 286 lbs. of cowpea hay, and 502 lbs. of sorghum hay. A third lot made an average gain of 1.59 lbs., requiring 724 lbs. of ground milo, 114 lbs. of cottonseed meal, and 1,124 lbs. of sorghum silage. A fourth lot made an average gain of 1.73 lbs. and required 657 lbs. of ground milo, 225 lbs. of cowpea hay, and 955 lbs. of sorghum silage per 100 lbs. of gain.

[Feeding experiments with baby beef at the Oklahoma station] (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 6, 7*).—The results of two experiments are briefly reported.

Determining comparative values.—Four lots of calves were selected for comparing the feeding value of ground corn, ground kafir, ground barley, and ground darso for baby beef production when fed with cottonseed meal, sorghum silage, and alfalfa hay. The experiment lasted 188 days. The lot receiving corn made the largest gains and the greatest profits. Kafir and barley also proved to be excellent feeds, but the calves receiving darso were not comparable in finish. The dressing percentages ranked in the same order as the gains.

Finishing baby beef.—Ground corn, ground wheat, ground milo, and ground kafir were compared for finishing baby beef when fed with cottonseed meal, silage, and alfalfa hay in a 190-day experiment. The lot receiving ground wheat made the most rapid gains and produced gains at the lowest cost. Kafir and milo did not produce quite the finish that was produced by corn and wheat but proved to be valuable feeds.

Sweet clover hay for beef cattle, C. G. Selvig and O. M. Kiser (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 78, 79, 100–104*).—In studying the value of sweet clover hay for beef cattle, four lots of 6 steers each were fed during the test period of 176 days. Three of the lots received oat straw and 15 lbs.

of corn silage per head daily, while another lot received oat straw but no silage. In addition, lot 1 received alfalfa hay, lot 2 sweet clover hay, lot 3 (no silage) sweet clover hay, and lot 4 sweet clover straw and ground oats.

The average daily gains of the four lots were, respectively, 0.84, 1.16, 0.65, and 0.15 lb. per head.

The authors conclude that sweet clover hay compared favorably with alfalfa hay for wintering steers, while sweet clover straw was a failure. The addition of corn silage produced a marked increase in the gains and decreased the calculated cost of gain. The difficulty of handling and properly curing sweet clover hay is pointed out.

Early lamb production in Arkansas, M. W. Muldrow (*Ark. Agr. Col. Ext. Circ. 178 (1924), pp. 4, fig. 1*).—This deals with the various factors involved in the production of early lambs in Arkansas.

Finishing lambs (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 7, 8*).—In this experiment rations of corn and linseed oil meal, corn and bran, milo and linseed oil meal, and kafir and linseed oil meal were compared for finishing lambs when fed with alfalfa hay. The lot receiving corn and bran made an average daily gain of 0.433 lb. per head as compared with 0.17 lb. for the other three lots.

British wools: Their growth and manufacturing possibilities, A. F. Barker (*Jour. Farmers' Club [London], 1925, pt. 1, pp. 18, figs. 4*).—A popular account of the quality and production of British wools, with special reference to the genetic factors involved.

[Hog feeding experiments at the Crookston Substation], C. G. Selvig and O. M. Kiser (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 79, 80, 104–109, fig. 1*).—The results of two hog feeding experiments are briefly noted.

Feeding value of wheat by-products for growing pigs on alfalfa pasture (pp. 79, 104–106). In comparing the feeding value of various wheat by-products, three lots of 8 pigs each averaging approximately 52 lbs. in weight were selected for a 139-day experiment. All lots were on alfalfa pasture and received ground barley and tankage hand-fed twice daily in addition to a self-fed mineral mixture. Supplements of standard wheat middlings and flour middlings were included in the mixture of two of the lots.

The average daily gains and feeds required per 100 lbs. of gain were as follows in the different lots: Lot 1, 1.09 lbs., requiring 405 lbs. of barley and 29 lbs. of tankage; lot 2, 1.09 lbs., requiring 304 lbs. of barley, 13 lbs. of tankage, and 99 lbs. of standard wheat middlings; lot 3, 1.13 lbs., requiring 290 lbs. of barley, 12 lbs. of tankage, and 95 lbs. of flour wheat middlings.

The authors conclude that the addition of flour wheat middlings increased the rate of gain and reduced the amounts of barley required per unit of gain, and it is suggested that the wheat products be used to supplement barley and tankage provided the price is favorable.

Hogging-off corn and soy beans (pp. 79, 80, 106–109).—Five lots of 8 pigs each averaging 90 lbs. were selected for this experiment. The feeding was as follows: Lot 1 ⅔ acre of standing corn and ⅓ acre of soy beans planted separately; lot 2, 1 acre of standing corn and soy beans planted together by mixing the seed at the rate of ⅔ corn to ⅓ soy beans; lot 3, 1 acre of standing corn and tankage self-fed; lot 4, 1 acre of standing corn; and lot 5 newly husked ear corn hand-fed, and tankage self-fed. The experiment lasted 52 days, during which the average daily gains made were as follows: 1.48, 1.4, 1.65, 1.23, and 1.58 lbs., respectively.

The authors' conclusions were that no advantage was shown for separately grown soy beans, and when planted with the corn sufficient was consumed to balance the ration. Tankage did not show a greater acre profit than when

soy beans were used as the protein supplement. The dry lot feeding was not found to be as efficient as the hogging off.

Swine feeding experiments [at the Morris Substation], P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1923, pp. 45–49*).—The results of four experiments in swine feeding are briefly reported.

Corn and tankage v. corn alone on alfalfa pasture.—In comparing the feeding of corn alone with corn and tankage on alfalfa pasture, three lots of 10 38-lb. Duroc-Jersey pigs were selected for a 93-day test. In addition to the alfalfa pasture the lots received corn alone, corn and tankage self-fed and free choice, and a mixture of corn and 10 per cent tankage self-fed. The average daily gains of the three lots were, respectively, 1.08, 1.18, and 1.24 lbs., the feed requirements per pound of gain in the first lot being 3.5 lbs. of corn, in the second lot 3.27 lbs. of corn and 0.32 lb. of tankage, and in the third lot 3.39 lbs. of corn and 0.37 lb. of tankage.

It is concluded that the feeding of from 8 to 10 per cent of tankage as a supplement to corn on alfalfa pasture was uneconomical.

Corn and tankage v. barley and tankage on pasture.—The average results of three years' experiments in comparing corn and tankage and barley and tankage for fattening 45-lb. pigs on pasture are reported. During two of the years the pasture consisted of rape, while sweet clover pasture was used the third year. The corn-fed pigs averaged 1.26 lbs. gain daily, while the barley-fed pigs averaged 1.3 lbs. during the 93- to 98-day tests. The feed required per pound of gain was 3.21 lbs. of corn and 0.32 lb. of tankage and 3.74 lbs. of barley and 0.37 lb. of tankage.

Alfalfa pasture v. sweet clover pasture.—For this experiment, lasting three months, two lots of Duroc-Jersey pigs averaging 38 lbs. in weight were selected. Both lots received a mixture of corn and tankage self-fed. The pastures were one-half acre in size. The average daily gains were 1.24 lbs. on alfalfa and 1.07 lbs. on sweet clover, the feed requirements being in the former lot 3.39 lbs. of corn and 0.37 lb. of tankage and in the latter 3.53 lbs. of corn and 0.39 lb. of tankage per pound of gain.

It is pointed out that the sweet clover suffered severely during the last 30 days of the experiment, due to drought, while the alfalfa survived the adverse conditions better.

Corn and tankage v. barley and tankage on sweet clover pasture.—Two lots of 10 38-lb. pigs were used in comparing corn and tankage and barley and tankage on sweet clover pasture during a three months' test period. The grains were self-fed mixed, 10 per cent tankage being included in each case. The average daily gains were 1.07 lbs. in the corn-fed lot and 1.24 lbs. in the barley-fed lot, the feed requirements being 3.53 lbs. of corn and 0.39 lb. of tankage and 3.6 lbs. of barley and 0.4 lb. of tankage per pound of gain.

All-year grazing for brood sows (*New Mexico Sta. Rpt. 1924, pp. 36–38*).—Three half-acre plats of rye and two half-acre plats of alfalfa were used for a year's grazing by 10 brood sows. A total of 2,623 lbs. of hogs was kept on two half-acre plats of rye for a continuous period of 162 days, during which time an average of 1.14 lbs. of grain was fed per 100 lbs. of live weight. The 52 pigs raised by these sows required 1.53 lbs. of grain per pound of gain up to weaning at 50 lbs. live weight. Thus there was a considerable saving in feed as compared with the requirements in dry lot.

[Hog feeding experiments at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1923–24, p. 8*).—The results of two experiments are briefly noted.

Preparation of wheat for hog feeding.—In a comparison of various methods of preparing wheat for hog feeding, wheat fed in the self-feeder showed a

slight advantage over ground wheat fed by hand, but moistening ground wheat was better than feeding dry. Grinding increased the value from 17 to 28 per cent. Soaking had no effect on ground wheat, but lowered the digestibility of whole wheat.

The effect of yeast upon the digestibility of feed.—In a study of different methods of preparing kafir for swine, grinding was found to increase its feeding value from 10 to 15 per cent, while soaking whole kafir tended to lower the feeding value. The addition of yeast to kafir showed no advantage and added materially to the cost of the ration.

The food value of dried whey solids, J. B. ORR and J. A. CRICHTON (*Scot. Jour. Agr., 6 (1923), No. 1, pp. 63-67*).—The feeding values of dried whey solids and lactalbumin for young pigs were tested at the Rowett Research Institute. In the first experiment suckling pigs 34 days old were allowed access to a mixture of whey solids and lactalbumin diluted with water to a consistency of milk, while other pigs in the same litter received whole milk. The latter group gained most rapidly at first, but the average gain per pig during 28 days was 18.7 lbs. for the whole milk lot and 17.8 lbs. for the other lot. There was little difference in the gains made by the pigs following weaning when they were placed on the same grain ration.

In another experiment with similar pigs three rations were compared, the basal ration consisting of corn, oatmeal, and sharps, with the additions for two other groups of skim milk and whey solids, respectively. The average gains per pig during the 28 days were on the basal ration 10.8 lbs., with supplements of whey solids 15.4 lbs., and with skim milk 17 lbs. The latter group required over 50 per cent more grain for making the gain than the lot receiving whey solids. The food value of dried whey solids for young animals and children is discussed.

Can hogs grind their own soybeans? (*Indiana Sta. Rpt. 1924, p. 12*).—In an experiment involving 3 lots of 12 hogs each whole and ground soy beans proved of equal value as supplements to corn self-fed. Unthreshed soy beans in the bundle were not so satisfactory either in the amount consumed or in the gains produced as threshed beans. All lots received a suitable mineral mixture.

Contribution to the knowledge of metabolism in fowls [trans. title] Z. SOKOLOWSKA (*Rocz. Nauk Rolnicz., 9 (1923), No. 2, pp. 211-234*).—The results of experiments dealing with the digestiblity of the cellulose of barley by fowls have indicated that this substance passes through the alimentary canal entirely undigested, while the cellulose of wheat bran and potatoes is mainly broken down by digestion. There was a better retention of nitrogen by birds receiving wheat bran and potatoes than by others receiving barley.

In the second part of the experiment birds were fed abundant rations of bran and potatoes and barley, both of which contained equal amounts of energy. The animals were subjected to an analysis at the end of the experiments. The birds on both rations had fattened, and a considerable increase in the protein of the body had occurred during the 28-day period.

The article is abstracted in French.

[Poultry experiments at the Indiana Station] (*Indiana Sta. Rpt. 1924, pp. 32-35, fig. 1*).—In continuing earlier work (E. S. R., 51, p. 873), it has been found that 10 per cent of animal protein in the ration is sufficient for laying hens, but when from 15 to 20 per cent was included during the summer and fall production was better maintained.

By supplementing soy bean meal with minerals its value for egg production has been found equal to meat scrap in three years' trials. The mineral mix-

ture used as a supplement consisted of 15 lbs. of common salt, 42 lbs. of acid phosphate, and 24 lbs. of ground limestone, and was added at the rate of 1.5 lbs. to 5 lbs. of soy bean oil meal.

In further experiments the optimum temperature for incubation has been found to lie between 100 and 103° F. when measured 1.5 in. above the egg tray.

The addition of dried buttermilk or dried buttermilk and green alfalfa to the ration of chicks raised in confinement has been found to lower the mortality materially. Green alfalfa and sprouted oats have given good results when fed together. Electric lights turned on at 4 o'clock in the morning during the months from October to March increased winter egg production 25 to 50 per cent.

Degerminated corn as used in certain commercial scratch feeds has been found deficient in vitamin B, polyneuritis having been produced in cockerels after three weeks' feeding. Corn germs fed for one week cured the condition. Mature cockerels were maintained for 20 weeks in normal condition when confined in a small space and receiving only white corn, notwithstanding its deficiency in minerals, protein, and vitamin A.

By trap nesting and selection the average production of the station flock has been increased 50 eggs per year.

[Experiments with poultry at the New Mexico Station] (*New Mexico Sta. Rpt. 1924, pp. 51–54*).—The results of the following experiments are briefly reported:

[*Protein feeds for laying hens*].—The results of a one year's experiment in comparing semisolid buttermilk with tankage and animal proteins are reported. Four pens were selected for this test, all of which received a basal mash consisting of 40 lbs. each of bran, ground oats, and ground corn, together with a scratch feed consisting of 2 parts of cracked corn, 1 part of whole wheat, and 1 part of barley. Two of the pens received additions to the mash of 30 lbs. of 60 per cent tankage, and one of these was subjected to the use of electric lights from 4.30 to 7.30 a. m. daily during December and January. A third and fourth pen received semisolid buttermilk ad libitum, but one of these received no mash.

The conclusions from the experiment indicated that electric lights increased production during the winter months, but that due to the high local cost of electricity its use was uneconomical. The pens receiving no mash but having semisolid buttermilk made the greatest net profit, though their production was not the highest, and this lot molted earlier than those receiving tankage. The costs of feed per bird were highest for those receiving buttermilk and mash, but the high rate of production made the net return greater than for birds receiving tankage without buttermilk.

[*Feeding baby chicks*].—Chicks fed corn bread and milk for the first 10 days of brooding were more thrifty and made more rapid gains than other chicks receiving a commercial mash. The high content of meat scrap and dry buttermilk in this mash made its protein content too high.

[*Prevention of death due to heat*].—The construction of a semimonitor colony house having additional ventilation provided by a door in the rear combined with well aerated nests was found to remove the cause of death among heavy hens getting on the nests and dying as a result of heat.

[Poultry experiments at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 30–33, 35*).—The results of experiments with poultry are briefly noted.

Time to hatch.—This project has dealt with the effect of the time of hatch on the mortality and development of chicks, time of molt, age at sexual matur-

ity, seasonal production, longevity, and intensity of production. Chicks were hatched at 2-week intervals during an entire year.

It was found that the fertility and percentage of chicks hatched were greatest from January to April, with a slight increase in the fall following lower percentages in the summer. Chicks hatched in the early spring grew much more rapidly than late hatched chicks, and the mortality in the latter case was also greater. The birds hatched in January started laying very early, but also suffered an early molt during the time when egg prices were high. The birds laying at a younger age were lighter in weight and laid smaller eggs.

Yellow v. white corn.—In this experiment, yellow corn, white corn, cod liver oil and white corn, and green feed and white corn were compared as to their influence on the vigor and fertility of fowls and the hatchability and rate of growth of the chicks developing from the eggs. All birds received a basal laying mash of wheat bran, barley meal, wheat shorts, and meat scrap in equal parts, with a small amount of bone meal and salt. Samples of the spermatazoa were collected, but the difficulties involved made the results of little value.

The egg production per hen averaged 139.7 for the lot receiving green feed and white corn, 127.5 for the lot receiving yellow corn, 122.1 for the lot receiving cod liver oil and white corn, and 67.5 for the lot receiving white corn alone. A marked difference in the pigmentation of the shanks and conditions of the birds of the different lots was evident. The most pigment and the best condition of health was with the yellow corn, while with green feed there was a lesser amount of pigment, and there was no pigment in the cod liver oil and white corn lot or in the white corn group. The hatchability of the eggs was only 55 per cent for the lot receiving yellow corn and from 67 to 69 per cent for the other lots. The white corn chicks could not be raised beyond 5 weeks of age, while those in the yellow corn pen were healthy and vigorous, making good growth. The chicks receiving green feed and white corn grew well, but did not have the thrifty appearance of those receiving yellow corn. The cod liver oil pen grew normally, although they were inferior when hatched.

Cost of producing hens.—The amounts of feed required to raise White Wyandotte pullets to the age of 36 weeks are tabulated.

Production of winter eggs, A. M. Pilkey (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 109–113*).—This is a popular discussion of the requirements for profitable winter egg production, dealing with the management and feeding of poultry, with special reference to the different grains and other feeds more frequently used.

One-man poultry farming, A. H. Capper (*Rudgwick, Sussex: Sci. Poultry Breeders' Assoc., [1924], pp. [5]+46, pl. 1*).—A popular account of the principles of poultry husbandry.

DAIRY FARMING—DAIRYING

Research work of the Bureau of Dairying, L. A. Rogers (*Jour. Dairy Sci., 8 (1925), No. 1, pp. 4–14*).—This address, delivered at the annual meeting of the American Dairy Science Association in 1924, deals with the problems and modes of attacking research in dairying.

Reymann Memorial Farms, H. G. Knight (*West Virginia Sta. Bul. 194 (1925), pp. 19, figs. 17*).—The activities on the Lawrence A. Reymann Memorial Experimental Farms (E. S. R., 36, p. 697) are briefly described, with plans for future experimental work. It is planned to divide the cattle into two groups and improve one group by proved sires of related blood, while unrelated proved sires will be used on the other group.

Dairy cattle breeds, A. B. Nystrom (*U. S. Dept. Agr., Farmers' Bul. 1443 (1925), pp. 32, figs. 23*).—This deals briefly with the history and characteristics of the dairy breeds, the numbers of each in the United States, and a tabulated list of the highest producers of each breed. It supersedes Farmers' Bulletin 893 (E. S. R., 38, p. 376).

The Pusa pedigree dairy herd in North Bihar, G. S. Henderson (*Patna: Govt., 1924, pp. [2]+49, pl. 1, figs. 12*).—An account of the dairy cattle and their management in India, with special reference to the Pusa herd, is given. Possibilities for the improvement of India cattle are suggested.

A study of the factors affecting the growth of dairy heifers, S. W. Mead, W. M. Regan, and J. W. Bartlett (*Jour. Dairy Sci., 7 (1924), No. 5, pp. 440–459, figs. 5*).—The effect of early weaning and different rations on the growth of calves in body weight, height at withers, and heart girth was investigated at the New Jersey Experiment Stations. Three different methods of feeding were tested.

Group 1, which consisted of 3 Jersey, 2 Holstein, and 2 Ayrshire calves, were weaned when from 30 to 40 days of age and placed on a ration of alfalfa meal and a grain mixture of 4 parts of yellow corn meal, 3 parts later being changed to 2 parts of old process oil meal, 1 part of wheat bran, and 2 per cent of salt plus a mineral mixture of raw rock phosphate and raw limestone which was mixed with the grain during part of the experiment and later self-fed. Group 2, which consisted of 3 Jersey, 1 Holstein, 2 Ayrshire, and 2 Shorthorn calves, received similar rations, but the calves were weaned when 10 days older. Group 3 consisted of 6 Holstein, 3 Jersey, 2 Ayrshire, and 1 Shorthorn calves, which were fed and handled similarly to group 1, except that 10 per cent of blackstrap molasses was added to the grain and 20 per cent to the alfalfa meal.

The weights and measurements of the calves were recorded to about 2 years of age for most of the animals in groups 1 and 2, but the calves in group 3 had not attained that age at the time the report was written. The authors state that, though the calves were surprisingly healthy, they were thin and below weight soon after weaning. A little scouring occurred in group 1 before reducing the amount of oil meal, and the molasses caused some scouring in group 3. The time required to return to normal weight depended upon the extent of the check in growth at weaning. The Holsteins recovered more rapidly than the other breeds, attaining normal weight at an average age of 200 days in group 1 as compared with 360 days for Jerseys and 760 days for Ayrshires. The skeletal measurements usually became normal at an earlier age than the body weights.

Soybean oilmeal and ground soybeans as protein supplements in the dairy ration, L. H. Fairchild and J. W. Wilbur (*Indiana Sta. Bul. 289 (1924), pp. 20*).—The first part of this bulletin reports the results of three trials in which soy bean oil meal and linseed oil meal were compared as components of the grain mixture of dairy cows during lactation.

Three lots of cows were fed in two of the trials, receiving old process soy bean oil meal, with and without minerals during different periods, and linseed oil meal during a third period. In one trial two lots of cows were used, the feeding being for three periods by the double reversal method. New process soy bean oil meal was fed in this trial, and one of the lots received minerals.

The results of the three experiments were not entirely uniform, but in general old process soy bean oil meal was superior to the product prepared by the new process, and both were superior to linseed oil meal for milk production and in the grain requirements. Old process soy bean oil meal produced milk of a higher fat percentage than linseed oil meal, but the reverse occurred with the

new process product. No definite effect was observed from the feeding of minerals.

The second part of the bulletin deals with the results of two experiments in which ground soy beans with and without minerals were compared with linseed oil meal for milk production.

The combined results of the two experiments indicated that the soy beans increased the milk production and maintained the fat percentage, as compared with the linseed oil meal. Less grain but more silage and hay were required for milk production with linseed oil meal. With the mineral supplements there was a decrease in milk production.

The authors conclude from the five experiments that soy bean oil meal and linseed oil meal are practically equal in value, while ground soy beans are superior to either.

Yeast as a supplementary feed for calves, C. H. Eckles, V. M. Williams, J. W. Wilbur, L. S. Palmer, and H. M. Harshaw (*Jour. Dairy Sci., 7 (1924), No. 5, pp. 421–439, figs. 8*).—In tests at the Minnesota Experiment Station in which 47 calves were fed, the addition of dried yeast to normal rations, including whole or skim milk, grain, and hay, did not increase the rates of gain from 2 weeks to 180 days of age.

In several experiments with rats, from 15 to 20 per cent of yeast in the ration was required for the production of normal growth. Increasing this amount did not have an additional stimulating effect. A calf ration was fed to rats, with and without yeast, with unsatisfactory results in both cases, due probably to an excess of bulk.

The correlation between changes in age and milk production of dairy cows under other than official testing conditions, R. S. Clark (*Jour. Dairy Sci., 7 (1924), No. 6, pp. 547–554, fig. 1*).—The author has made a study of the effect of age on milk production by combining the yearly records made under *other than official test conditions in various experiment station herds.* There were available for the study 280 records on 77 Holstein cows, 632 records on 189 Jerseys, 540 records on 139 Guernseys, and 231 records on 70 Ayrshires. Maximum production was attained at 8 years by Holsteins, Jerseys, and Guernseys, but at 9 years by Ayrshires. Increases in production were relatively small after 6 years. The percentage production at various ages is compared with the results of other investigators, and good agreement is evident.

Guide to the conduct of clean milk competitions, J. F. Blackshaw et al. (*[Gt. Brit.] Min. Agr. and Fisheries, Misc. Pub. 43 (1924), pp. 27, pl. 1*).—Directions for conducting clean milk competitions as carried on in England.

Relation of solids in milk to fat and specific gravity of the milk, O. R. Overman, F. A. Davidson, and F. P. Sanmann (*Illinois Sta. Bul. 263 (1925), pp. 263–271, fig 1*).—The total solids as determined by actual analyses and by the formula $TS=\frac{L}{4}+1.2\ F$ have been compared, using as a basis 1,158 samples of milk from individual cows, 134 random samples of mixed milk, and 40 samples taken from large lots in storage or pasteurizing vats.

It was found that in the milk from individual cows the average actual total solids percentage was 0.173 higher than was calculated by the formula. Likewise in case of the other milk, the actual was 0.105 higher for the random samples and vat samples. The standard deviation for the difference was shown to decrease from 0.340 ± 0.0048 for the individual samples to 0.242 ± 0.0010 per cent for the random samples and 0.100 ± 0.0008 per cent for the vat samples. A calculation of the limits within which it would be expected, with odds of 30 : 1, that a given sample would be accurate showed that the range for individual [illegible] was too great for practical use, but a range of

± 0.214, as was calculated for the vat samples when making the correction of 0.105 to the formula, indicated a practical value for its own use.

Further observations on the influence of sunlight upon the growth-promoting and antirachitic properties of cow's milk, E. M. Luce (*Biochem. Jour., 18 (1924), No. 6, pp. 1279–1288, figs. 2*).—This paper reports the results of a continuation of the experiments previously noted (E. S. R., 52, p. 277). The same cow was continued on a dry ration deficient in the fat-soluble vitamins from October 23, 1923, to July 2, 1924, the cow having been kept outdoors in sunlight in the daytime and inside at night until December 19. She was confined to a light stall from December 20 to April 16 and kept outdoors in the sunlight during the day from April 17 to July 2. Samples collected at the end of the three periods of management were tested for their growth-promoting and antirachitic properties with rats as in the preceding paper.

The results were in conformity with those previously noted, except that it was shown that the antirachitic value of the milk is mainly a matter of diet, though sunlight has a small effect.

[Experiments in dairying at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 11, 12, 14, 15*).—The results of experiments relating to the manufacture of dairy products are briefly noted.

Quality of gelatin (p. 11).—Tests of approximately 200 samples of commercial gelatin have indicated that the higher grades are slightly less soluble in water than the lower grades, but the high grade gelatins show a greater strength test, have practically no odor, are nearly or entirely transparent in color, and have a low ash and bacterial content. None of the high testing gelatins contained more than a trace of fat. The actual use of the different samples of gelatin in the manufacture of ice cream indicated that the lower grades were not satisfactory.

Commercial buttermilk (pp. 11, 12).—Studies of the commercial manufacture of buttermilk indicated that a good quality of skim milk or whole milk is essential, which should be thoroughly pasteurized before the addition of the pure culture of lactic acid bacteria. The temperature of ripening the buttermilk and the care of the starter are very important factors in the successful production of a good product. A buttermilk temperature machine was also found essential to the satisfactory production of buttermilk. Further experiments showed that contact with copper and zinc vessels produced distinct metallic flavors, but none was noted from aluminum or tin containers.

Manufacture of ice cream (pp. 14, 15).—In experimental studies in ice cream manufacture it has been found that the bacterial content acts as an indicator of the quality of the raw materials, the thoroughness of pasteurization, the efficiency of the holding temperature prior to freezing, and the care with which the mix has been handled. In other experiments it was found that the serum solids content of the mix could be as high as 20 per cent without the development of sandiness when the lactose content was lowered by the use of a condensed milk from which 75 per cent of the lactose had been removed. The churning of ice cream during freezing has been entirely eliminated by the use of a viscolizer prior to freezing. Freezers not in good working condition tend to produce buttering, but this condition could not be produced in thoroughly viscolized or homogenized mixes.

Cooling cream on the farm for buttermaking, V. C. Manhart (*Indiana Sta. Bul. 290 (1925), pp. 8, figs. 6*).—The scores of butter made from 4- and 7-day collections of cream have been recorded. In each case one portion of each supply was cooled, while the other was uncooled. Four churnings were made from each type of cream. The average scores of the butter were for the 7-day collections of uncooled cream 85.69 and for cooled cream 87.75, and

for the 4-day collections for uncooled cream 86.75 and for cooled cream 89.44. The necessity of frequent collection and proper cooling of cream is pointed out.

The improvement of flavor and keeping quality of hand-separator-cream-butter, M. MORTENSEN (*Jour. Dairy Sci., 7 (1924), No. 5, pp. 460–467*).—In a comparison at the Iowa Experiment Station of the effect of the pasteurization temperature and acidity of sour cream on the flavor and keeping quality of butter made from the cream, samples of cream were pasteurized at 145° F. for 30 minutes and at 170° and 180° for 20 minutes. The butter was scored on arrival at the market and after from 2 to 9 months' storage at 0°.

The results of 17 comparisons indicated that a pasteurization temperature of 170° produced a slightly superior product to that resulting when the cream was pasteurized at 145°; but butter pasteurized at the higher temperature did not appear to keep as well over a 9 months' storage period. Pasteurization at 180° did not give quite as satisfactory results as at 170° in 9 experiments.

The neutralization of sour cream was also found to improve the quality and reduce the amount of deterioration occurring in the butter.

Facts about carbonated butter, O. F. HUNZIKER (*Jour. Dairy Sci., 7 (1924), No. 5, pp. 484–496*).—The results of various scientific investigations are presented to disprove certain advantages claimed for carbonated butter.

Clarification of milk for cheese making, W. B. COMBS, W. H. MARTIN, and N. A. HUGGLAR (*Jour. Dairy Sci., 7 (1924), No. 5, pp. 524–529, figs. 2*).—This is a more complete account of the experiments previously noted by Hugglar (E. S. R., 52, p. 279).

Further studies on the bacterial flora of the "Kingston cheese," C. D. KELLY (*Jour. Dairy Sci., 7 (1924), No. 6, pp. 555–575*).—The author has studied the flora of Kingston cheese and found it very similar to that of Cheddar cheese. At least 97 per cent of the flora were acid formers, *Streptococcus lactis* types being the most prevalent in the day-old cheese, while *S. lactis* and Lactobacillus types were prevalent in 10-day-old cheese. The organisms isolated were classified.

Statistics of dairy factories, 1923, R. H. COATS (*Canada Bur. Statis., Dairy Factories, 1923, pp. XVI+68*).—This contains the usual statistics on the production of dairy products in Canada during 1923 (E. S. R., 51, p. 381).

VETERINARY MEDICINE

Report of the proceedings of the twenty-eighth annual meeting of the United States Live Stock Sanitary Association (*U. S. Livestock Sanit. Assoc. Rpt., 28 (1924), pp. 179, figs. 2*).—The papers presented at the annual meeting of the association held at Chicago in December, 1924 (E. S. R., 51, p. 781), include the following: Report of the Special Committee on Foot-and-mouth Disease, by A. W. Miller et al. (pp. 20–32); The Control of Contagious Abortion and Sterility from the Standpoint of the Clinician, by W. L. Boyd (pp. 33–37); Control of Contagious Abortion from the Standpoint of the Breeder, by H. W. Norton, jr. (pp. 37–41); Regulating Traffic in Contagious Abortion, by J. H. Coffman (pp. 42–44); Report of the Committee on Abortion, by C. P. Fitch et al. (pp. 44–55); Rabies and Its Control, by V. A. Moore (pp. 55–61); Some Problems of Transportation Affecting the Practitioner, by W. H. Welch (pp. 62–68); Several Uncontrolled Factors Frequently Associated with the Commercial Process of Pasteurizing Milk, by G. W. Grim (pp. 73–78); Milk as Related to Public Health, by H. N. Bundesen (pp. 79–81); The Relation of Milking Utensils to Sanitary Quality of Milk, by M. J. Prucha (pp. 82–88); Is Raw Milk Safe? by O. C. Bowes (pp. 89–93); The Problems

of Tuberculosis Control in Cattle under Range Conditions, by W. J. Butler (pp. 97–100); A Report on the Part Played by Avian Infection in the Increase of Swine Tuberculosis, by L. Van Es (pp. 101–105); Comparative Lessons in Infection, Detection, and Control of Tuberculosis, by H. Fox (pp. 106–111); Tuberculosis Eradication in Wisconsin from an Administrative Standpoint, by J. D. Jones, jr. (pp. 112–116); Skin-lesion and No-lesion Tuberculosis Reacting Cattle, by B. A. Beach and E. G. Hastings (pp. 117–119); Preliminary Organization of the Factors Involved in Tuberculosis-free Areas, by R. L. Cuff (pp. 120–122); Report of Committee on Tuberculosis, by M. Jacob et al. (pp. 129–135); The Value and Application of Sanitary Measures in the Control of Swine Diseases, by C. H. Hays (pp. 138–142); Tuberculosis and Its Transmission, by C. H. Mayo (pp. 143–146); The California and Texas Foot-and-mouth Disease Outbreaks, by J. R. Mohler (pp. 147–152); The 1924 Outbreak of Foot-and-mouth Disease, by G. H. Hecke (pp. 153–159); Report of the Committee on Inter and Intrastate Shipment of Swine, by P. Malcolm et al. (pp. 167–171), and Report of Tick Eradication Committee, by E. P. Flower et al. (pp. 175, 176).

[Report of the Indiana Station] department of veterinary science (*Indiana Sta. Rpt. 1924, pp. 44–47, figs. 2*).—Brief reference is made to hog cholera immunity, it having been found that pigs from an immune mother remained well following an inoculation with cholera virus when 15 days old. Tests on pigs show conclusively that cholera virus is not destroyed by drying eight days at room temperature.

Report of the veterinary pathologist [of the Colorado Station], I. E. Newsom (*Colorado Sta. Rpt. 1924, pp. 36–38*).—A very serious outbreak of paratyphoid dysentery, involving some 30,000 lambs, occurred in the Fort Collins district during October, 1923, approximately 2,000 head being lost. A thorough investigation resulted in the isolation of the causative organism and the determination of the relation of fasting to the disease. The disease is described in sheep for the first time. The work has shown that large doses of the organism can be given to healthy animals without their showing any symptoms provided they are fed continuously, and that special precautions should be taken to see that lambs be fed at frequent intervals while in transit, since small doses by mouth will produce a fatal disease after a 48-hour fast.

Icterohematuria continues to cause a loss among the older sheep in the mountainous districts, where it seems to be getting more serious. Losses of sheep in the Fort Collins district during the season, which amounted to approximately 3 per cent, took place in lambs that were getting heavy grain rations, and the stopping of these rations eliminated the losses.

In discussing contagious abortion, it is reported that a very serious outbreak occurred in the college herd during the year. By making blood tests at frequent intervals and separating the animals into two groups on the basis of the tests, the disease was entirely eliminated from the herd.

Cooperative poisonous plant investigation (*New Mexico Sta. Rpt. 1924, pp. 38, 39*).—In cooperation with the U. S. D. A. Bureau of Plant Industry and B. W. Rentfrow, a study was made of a small plant, *Drymaria glauca*, peculiar to the vicinity of Carrizozo and which stockmen have for a long time thought might be the cause of the loss of cattle. The plant and its growth are briefly described.

Attempts to feed Drymaria to range cows having failed, two cows were each drenched with an extract from 7 lbs. of the plant, both dying 23 hours later. Post-mortem examinations showed the presence of inflammation of the third stomach and red blotches in the small intestines, the gall bladder of both cows

being abnormally enlarged and containing a yellowish fluid, thus showing the plant to be poisonous to cattle.

Observations of the effect of B. abortus Bang on the weight of the spleen of the guinea pig, C. P. FITCH and R. E. LUBBEHUSEN (*Minnesota Sta. Tech. Bul. 24 (1924), pp. 3-23, figs. 8*).—In this investigation observations were made on autopsy of 87 guinea pigs in which *Bacillus abortus* infection had been proved by direct cultural and serological tests. For purposes of comparison, the normal spleen weights for body weights of the animals were calculated by the formula devised by Bessesen and Carlson.[3] The data obtained are reported in 8 charts, in all but 1 of which spleen weights are plotted as ordinates and gross body weights as abscissas. The final chart shows the relation between the weight of the spleen and the number of days following inoculation.

In all but 5 of the 87 infected guinea pigs the weights of the spleen were higher than normal for body weight. The lowest, highest, and average weights were 0.53, 4.627, and 1.695 gm. as compared with an average of 0.734 gm. for the normal. When plotted according to the source of infected material, the spleens of 13 guinea pigs infected with fetal material varied in weight from 4.627 to 0.572 gm., with an average of 2.241 gm., as compared with the normal for this group of 0.738 gm. In 9 guinea pigs infected with placental material, the corresponding figures were 1, 2, 1.776, and 0.7237 gm., respectively. In 39 infected with milk and colostrum, the average weight of the spleen was 1.492 gm. as compared with a normal of 0.734 gm. In 17 infected with *B. abortus* cultures, the spleens varied in weight from 3.788 to 0.564 gm., with an average of 1.815 as compared with the normal average of 0.7093 gm. The average weight of 9 spleens of guinea pigs infected with miscellaneous material was 1.505 gm. as compared with a normal of 0.7378 gm." The comparison of the duration of time following inoculation with the changes in spleen weight showed that the length of time after inoculation does not materially affect the weight of the spleen.

It is concluded that, although *B. abortus* infection in guinea pigs usually gives rise to a marked increase in spleen weight, too much reliance can not be placed upon this change in the diagnosis of *B. abortus* infection.

The relation of the subcutaneous administration of living Bacterium abortum to the immunity and carrier problem of bovine infectious abortion, G. H. HART and J. TRAUM (*California Sta. Tech. Paper 19 (1925), pp. 50, fig. 1*).—The authors' investigations, the details of which are presented in tabular form, have demonstrated the value of living cultures of *B. abortum* in preventing abortion in the vaccinated animals when subjected to the identical infection that produced abortion in the control animals.

"A correlation of the agglutination tests of the animals with the definite periods when *B. abortum* was known to have been eliminated shows that this organism may be discharged from the body without its presence being suspected from the agglutination titer of the blood. This calls attention to the limitations of the agglutination test rather than demonstrates its inapplicability as a means to be used in the control of the disease. It has been demonstrated that, in a certain percentage of lactating animals injected with *B. abortum* under the skin of the neck, the organisms so injected, or their progeny, will gain access to the udder and be eliminated with the milk. Vaccinated animals may, therefore, become spreaders of the infectious agent under these conditions and can not with safety be moved into uninfected herds. Animals that develop sufficient immunity to *B. abortum* infection after vacci-

[illegible]

nation to prevent abortion or disease of the placental tissues may still harbor the living organism and eliminate it from the udder.

"Nonpregnant animals injected with living *B. abortum* subcutaneously when not in lactation and not exposed to further infection failed to show the presence of the organism in the placenta or colostrum at the termination of the following pregnancy. Animals exposed to *B. abortum* in no other way except by vaccination will continue to give positive agglutination tests in a titer of 1-100 for several months to one year after the injection. Vaccination of virgin heifers may be a factor in retarding their impregnation, but this has not been satisfactorily demonstrated."

A bibliography of 23 titles is included.

A study of the protective powers of the various blackleg immunizing agents, A. S. SCHLINGMAN (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 6, pp. 712–723*).—In this study of the potency of antiblackleg serums and blackleg filtrates, guinea pigs were injected with varying amounts of the material in question and tested for immunity at intervals thereafter by the injection of virulent strains of *Bacillus chauvoei, Vibrion septique,* and *B. edematis maligni.*

Of the five antiblackleg serums tested, two protected against *B. chauvoei*, only one against *V. septique* and slightly against *B. chauvoei*, one slightly against *B. chauvoei* and *V. septique*, and one against *V. septique* and *B. edematis maligni.*

In the tests with blackleg filtrates, data obtained with one filtrate only are given as typical of all the filtrates used. This was used in 0.4 and 0.5 cc. amounts, followed by the injection 3 days later of 5 m. l. d. of 24-hour cultures of the three organisms. Of the six animals used in each of the three series of tests only one survived, showing that immunity with small doses of the filtrate is of low order.

The morphology and cultivation of the causative organism of foot-and-mouth disease [trans. title], P. FROSCH and H. DAHMEN (*Arch. Wiss. u. Prakt. Tierheilk., 51 (1924), No. 2, pp. 99–122, pls. 2, fig. 1*).—In the first part of this work (pp. 99–107) Frosch deals with the morphology, and in the second part (pp. 108–122) Dahmen deals with the cultivation of the causative organism of foot-and-mouth disease, brief accounts of which, from other sources, have been noted (E. S. R., 52, p. 179).

The results of foot-and-mouth disease studies in the laboratory and in the field from 1920 to the present time [trans. title], A. J. WINKEL (*Tijdschr. Diergeneesk., 52 (1925), No. 5, pp. 229–239*).—A brief review is given of the newer methods of combating foot-and-mouth disease. A classified list of 107 references to the literature is appended.

Rinderpest in Western Australia, 1923, W. A. N. ROBERTSON (*Aust. Dept. Health, Serv. Pub. (Vet. Hyg.) No. 1 (1924), pp. 58, pls. 13, figs. 19*).—This is a detailed report upon the outbreak of rinderpest, the first to occur in Australia, which was discovered in November, 1923, in dairy herds of the Beaconsfield area. This area is situated within 2 miles of Fremantle, the principal port of Western Australia, located 12 miles from Perth, the capital. The disease is thought to have been introduced by vessels carrying livestock as ship's stores. The outbreak was eradicated through the drastic policy adopted, providing for the removal of all pabulum by slaughtering all stock within a radius of 1 mile from an infected center, followed by a thorough cleaning and disinfection. It is stated that no case of rinderpest has been reported on the mainland from December 18 up to the time of the submittal of the report on June 1, 1924. In the eradication of the disease the Commonwealth decided to contribute 50 per cent to the compensation for destruction, and later to pay

£7,000 for destruction of miscellaneous property and vegetables which were unmarketable owing to restrictions. It is estimated that the total cost for all services will not exceed £50,000.

Studies in genital disease, W. L. Williams, D. H. Udall, J. N. Frost, S. A. Goldberg, et al. (*Cornell Vet., 14 (1924), No. 4, pp. 315–374, pls. 26*).—This study, based upon case reports, deals with observations of abortions in 23 cattle, premature birth in 16, retained fetal membranes in 51 cows and 2 mares, and milk fever in 12. Studies of the transmission of permanent genital infection from parent to offspring and histopathology are also reported upon.

The paranasal sinuses of bovines, L. Preziuso (*Le Cavità Paranasali dei Bovini. Turin: R. Ist. Super. Med. Vet., Ist. Anat. Norm., 1924, pp. 85, pls. 3, figs. 2*).—This is a report of studies of the structure, function, and development of the paranasal sinuses of bovines. A bibliography of 31 titles is included.

The bacteriology of the intestinal tract of young calves with special reference to the early diarrhea (" scours "), T. Smith and M. L. Orcutt (*Jour. Expt. Med., 41 (1925), No. 1, pp. 89–106, pl. 1*).—In an attempt to obtain some information concerning the cause of scours in young calves, observations were made of the bacterial flora of the fourth stomach and the intestines of five groups of calves from the same herd: (1) An early normal group killed within 24 to 72 hours of birth; (2) a group about 2 days old, evidently in an early stage of scours, but as yet without definite symptoms; (3) calves having diarrhea and symptoms of toxemia; (4) calves examined immediately after natural death from scours or within 12 hours after the bodies had been chilled with a stream of cold water and refrigerated; and (5) normal calves up to 3 or more weeks of age.

The conditions found in the respective groups were as follows: In group 1 a fairly stable bacterial flora was found. The fourth stomach contained *Bacillus acidophilus* and Gram-positive cocci, and the same species were found at the different levels of the small intestine until the cecum was reached. In the ileum *B. coli* was found in small numbers. In group 2 *B. coli* was found in the ileum in fairly large numbers and occasionally in one or more segments farther up. In group 3 the multiplication of *B. coli* in the lower segments of the small intestine was pronounced in all cases. In group 4 the small intestines were flooded with *B. coli*. In group 5 *B. coli* was either absent or else present in small numbers.

In discussing the significance of these results, particularly with reference to the feeding of colostrum, it is noted that newborn calves receiving no colostrum or receiving it after some delay may die of *B. coli* septicemia manifesting itself as scours, that calves receiving an insufficient dose of colostrum may contract various bacterial diseases, and that calves receiving a sufficient dose of colostrum may still develop scours due to local multiplication of *B. coli* in the small intestine. Concerning the forces tending to hold *B. coli* in check or to cause it to multiply in the intestine, it is concluded that "there exists in the young calf a delicate balance between certain strains of *B. coli* and the mucous membrane and digestive ferments, which, upset in favor of *B. coli*, produces scours. The necessary conditions for such attacks are in part inherited defects of the digestive tract, both morphological and functional, and special types of *B. coli*, resident in the herd and environment."

The inoculation of sheep with the bovine Anaplasma [trans. title], E. Sergent, A. Donatien, L. Parrot, F. Lestoquard, E. Plantureux, and H. Rougebief (*Bul. Soc. Path. Exot., 17 (1924), No. 4, pp. 295–298*).—Of 16 cattle inoculated with blood from sheep, 15 of which sheep had been inoculated with

A. marginale from cattle, 2 developed a benign infection, demonstrating that sheep are reservoirs for the virus. Attempts to pass the virus from sheep to sheep failed. A preliminary note on the investigations has been noted (E. S. R., 51, p. 383).

A second note on the piroplasmoses of sheep in Algeria.—Anaplasmosis: Anaplasma ovis n. sp. [trans. title], F. LESTOQUARD (*Bul. Soc. Path. Exot., 17 (1924), No. 9, pp. 784–788*).—In continuation of the investigations above noted, the author reports the discovery of *A. ovis* n. sp. to occur among sheep in Algeria in addition to *Babesiella ovis*, *Gonderia ovis*, and *Theileria ovis*.

A study of the internal parasites of sheep and their effects on the economy and rates of gain, W. E. HUNT (*Cornell Vet., 15 (1925), No. 1, pp. 45–51*).—Investigations conducted in Minnesota have led to the conclusion that "symptomatology alone is not to be relied upon as an indication of the presence of stomach worms. The thin, emaciated lambs arriving on the public markets in the fall are not so severely infested with stomach worms as to inhibit gains on feed. The severe losses as a result of stomach worms occurred earlier in the season. Lambs arriving on public livestock markets graded as cull lambs but showing evidence of good breeding will make satisfactory and economical gains on feed. One per cent nicotine sulfate solution was not found to be efficient as a treatment for stomach worms in this trial."

A note on treatment of surra in donkeys by intravenous injections of tartar emetic, K. SINGH (*Punjab Dept. Agr., Vet. Bul. 14 (1924), pp. 5*).—The author reports experiments conducted at Sohawa in which five artificial surra cases were treated with tartar emetic. While three of the cases recovered, no definite conclusions can be drawn until it is tested on a large number of natural cases.

Some observations on the body temperature of poultry, F. M. FRONDA (*Cornell Vet., 15 (1925), No. 1, pp. 8–20, fig. 1*).—The author finds the minimum normal body temperature of chickens to occur from 10 p. m. to midnight and the maximum some time during the afternoon. The variations in the body temperature are not as great as they were thought to be. There is not much difference between the average daylight body temperature of the different breeds of fowls studied, the normal daylight body temperature of the chicken varying from 105.0 to 109.4° F., depending upon the time of the day the observation is made. There is a considerable variation in the average daylight body temperatures of the different species of poultry, ranging from 105.3° in the goose to 108.8° in the pheasant. The differences between these variations in poultry and in other domestic animals, except the horse and the ox, are not significant.

Poultry diseases, E. L. BRUNETT (*Cornell Vet., 14 (1924), No. 2, pp. 89–100*).—This is a brief discussion of the poultry diseases most commonly met with in New York, with references to the literature.

A filterable virus disease of chickens (fowl plague?), E. L. BRUNETT (*Cornell Vet., 15 (1925), No. 1, pp. 4–8*).—An account of the occurrence of a septicemic disease of chickens which is thought to be European fowl plague.

Fowl plague, a new chicken disease, in America, V. A. MOORE (*Cornell Vet., 15 (1925), No. 1, pp. 1–3*).—A brief account of this disease, which appeared at several points in the United States in the fall of 1924.

Anthelmintic treatment for the removal of heterakids in fowls, H. W. GRAYBILL and J. R. BEACH (*Cornell Vet., 15 (1925), No. 1, pp. 21–36*).—In investigations at the California Experiment Station, the authors find rectal injections of anthelmintics to be more effective against cecum worms (*Heterakis gallinae*) than administration by ingestion.

"Carbon tetrachloride and Blackleaf 40 in rectal injections are both highly effective against cecum worms, but the toxicity of the latter requires that the dosage be determined with great care to render it safe. Carbon tetrachloride administered per os. is nontoxic in doses up to 10 cc. It is unsatisfactory against cecum worms, but is nearly 100 per cent effective against intestinal roundworms (*Ascarida galli*). It is most conveniently and safely administered in 1 cc. gelatin capsules. The dose for adult fowls should be 3 cc.

"Blackleaf 40 administered per os. in 0.5-gm. doses inclosed in gelatin capsules is somewhat more effective against cecum worms than carbon tetrachloride, and is practically 100 per cent effective against the intestinal roundworms. However, a dosage of 0.5 gm. is not safe. On account of its high toxicity and a marked variability in its toxic effects, Blackleaf 40 administered in capsules does not appear to be a promising method of treatment, although it is possible a safe and effective dosage might be determined. Blackleaf 40 in doses of 50 mg. fed with the mash daily for a period of three weeks is low in its efficacy against cecum worms, but has practically 100 per cent efficacy for the intestinal roundworm.

"Finely ground tobacco dust containing 1.62 per cent nicotine mixed with dry mash in the proportion of 2 per cent by weight is just as effective against cecum worms as Blackleaf 40, but to a lesser degree against the intestinal roundworms."

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Indiana Station] (*Indiana Sta. Rpt. 1924, pp. 36–39, figs. 3*).—Tests of binder twine showed that the average tensile strength for most brands tested was above the guaranty, but that the lack of uniformity in both tensile strength and thickness of the twine was the cause of breaks. It was found that the tensile strength of binder twine is directly proportional to the number of fibers in it, and that the number of fibers is of greater importance than their length. It was further found that the thickness of binder twine is not always an indication of its strength, since loosely twisted twine allows fibers to slip, causing the stress to be carried by individual fibers.

Studies of the requirements for apple storage showed that with no means of mechanical refrigeration or heating available, the temperatures inside an apple storage house tended to follow prolonged outside conditions. The humidity within the storage rooms was easily maintained at approximately 90 per cent saturation, with 80 per cent as a minimum, regardless of outside changes. Temperatures could be reduced by natural draft to as low a degree as by forced ventilation, but not so quickly.

Experiments with a home lighting plant propelled by wind showed that this outfit had a capacity to produce an average daily output of 97.2 ampere hours, or enough electricity to light the average farm home and also operate such appliances as a sewing machine or vaccum cleaner.

[Irrigation investigations at the Colorado Station], R. L. Parshall (*Colorado Sta. Rpt. 1924, pp. 33–36*).—A continuation of the Venturi flume studies showed that with the 1-ft. flume a marked degree of submergence is possible before the discharge is reduced from that of the free flow, due to the formation of a hydraulic jump within the structure. As the width of the throat increases the degree of resistance to submergence also increases. For the smaller flumes the allowable degree of submergence is from 70 to 75 per cent, and for the larger sizes from 75 to 80 per cent.

Laboratory studies of evaporation to determine the effect of wind (E. S. R., 51, p. 684) showed that under still-air conditions the rate of evaporation decreases as the difference in temperature of the air and water increases. Within the laboratory the maximum rate of evaporation occurs at about sunrise. Under fully exposed conditions the rate is greatest during the afternoon.

[Irrigation experiments at the New Mexico Station] (*New Mexico Sta. Rpt. 1924, pp. 20–23*).—The progress results of duty of water investigations for various crops are reported and discussed (E. S. R., 51, p. 483).

The treatment of alkali and other waters for domestic use, G. A. CUMINGS (*Colorado Sta. Rpt. 1924, p. 40*).—It is reported that the domestic water supplies of Colorado as a whole are good, although alkali waters may be found in practically every section of the State. Distillation is the only method by which alkali water may be purified for drinking purposes. Water may be distilled from 10 to 15 per cent cheaper with coal than with artificial gas.

Strength of materials, W. E. WINES (*New York and London: McGraw-Hill Book Co., Inc., 1923, pp. XX+241, figs. 104*).—This is one of the Engineering Education Series, prepared in the extension division of the University of Wisconsin. The subject matter has been selected to meet the requirements of both machine and structural designers and to form the foundation for more advanced study along these lines. Chapters are included on fundamental properties of materials and their measurement; materials; simple stresses; elastic properties of materials; thin-walled cylinders, pipes, and riveted joints; center of gravity and moment of inertia; beams—reactions, shear, and bending moments; beam stresses and deflections; columns; and torsion.

A. S. T. M. standards, 1924 (*Philadelphia: Amer. Soc. Testing Materials, 1924, pp. 1219, pls. 5, figs. [175]*).—This volume contains the 220 standard specifications, methods of test, definitions of terms, and recommended practices in effect at the time of its publication, as established by the American Society of Testing Materials.

Permeability tests on broken stone concrete, M. O. WITHEY and C. A. WIEPKING (*Wis. Univ. Bul., Engin. Ser., 9 (1923), No. 2, pp. 55, figs. 15*).—Tests of the influence of age, thickness, richness of mix, grading of aggregate, time of mixing, consistency, curing treatment, and direction of flow on the water-tightness of broken stone concrete are reported.

None of the concretes tested were absolutely water-tight, if continuous flow into the specimen is considered proof of permeability. The specimens of rich mixes when submitted to proper curing conditions were so impervious that no leakage was apparent at the free surface. Such concretes are considered water-tight for ordinary purposes.

The cement content of a given mix appeared to be the most important factor in determining the degree of impermeability. Other factors remaining constant, the water-tightness of concrete made with well graded aggregate increased with the proportion of cement in the mix. This was very marked as the cement content was raised until the ratio of cement to aggregate by weight was 0.15. A further increase in cement content was attended by a relatively small increase in water-tightness. For the broken stone concretes a ratio of cement to aggregate by weight of 0.17 or more gave a water-tight mix, whereas a cement-aggregate ratio of 0.14 was sufficient for gravel concrete mixes. Mixes containing high proportions of cement were much less affected by variations in consistency, time of mixing, and grading of aggregate than lean mixes.

The ratio of the volume of cement to the volume of air plus water voids is considered to be a valuable measure of both the strength and water-tightness

of concrete. The strength increased nearly in direct proportion to the cement-voids ratio for the mixes tested. Water-tightness in the mixes of broken stone concrete was obtained when the cement-voids ratio was 0.55 or above. A ratio of 0.45 gave similar results for gravel concrete.

The water-tightness of mixes containing less than 14 per cent of cement to total dry materials by weight was much affected by variations in consistency, curing conditions, placement, and grading of the aggregate. It was also affected to a lesser extent by variations in the time of mixing and by the moisture content of the fine aggregate. Lean concretes made of angular broken stone were more sensitive to the effects of these variables than similar mixes containing round pebbles. Maximum water-tightness was found to obtain for a limited range of the water-cement ratio. This range was much wider for the rich mixes than for the lean ones.

A plastic consistency giving a slump of from 1 to 3 in. when tested in a 6 by 12-in. cylinder appeared to be best suited to produce an impervious concrete with a minimum of cement. The use of excessive amounts of water greatly increased the permeability of lean mixes. It was necessary that concrete be cured in a moist atmosphere or under water to secure a high degree of imperviousness. Lean mixes or thin sections required longer wet-curing periods than rich mixes or thick sections. The effect of dry-curing appeared to be much more detrimental to water-tightness than to compressive strength. It appeared that lean mixes made with damp sand required a somewhat longer mixing period than when made with dry sand.

These results are taken to indicate that for making water-tight concrete well-graded gravel of good quality is superior to broken stone of like quality and grading.

Modern road construction and maintenance, H. E. GOLDSMITH (*Hongkong: Kelly & Walsh, Ltd., 1923, 2. ed., rev. and enl., pp. XVIII+252, pls. 16, figs. 9*).—This is the second revised and enlarged edition of this book, the purpose of which is to record the improvements which are daily being discovered in the methods of modern road construction and maintenance, with special reference to tropical conditions. It is stated that much of the material used in the text has been prepared from notes made in carrying out improvements to the highways of the Colony of Hongkong, and from various conferences in connection with modern road construction attended by the author in England, Australia, and America.

Chapters are included on new roads, with particular reference to the work required in opening up undeveloped country in hilly districts; setting out work; footpaths, curbing, and channeling; asphalt; asphalt macadam; asphaltic concrete; sheet asphalt; bituminous treatment of surfacing; water-bound macadam; tar macadam; concrete roads; rubber roads; methods of selecting and forwarding samples; tools required for use in asphaltic works; and testing materials. Three appendixes are included.

The road, H. BELLOC (*Manchester: British Reinforced Concrete Engin. Co., Ltd., 1923, pp. [11]+218, figs. 20*).—This is a brief treatise on English roads, containing chapters on the origin of roads, the crossing of marsh and water, passability, the obstacle of vegetation, political influences, the reaction of the road, the road in history, the "blindness" of English roads, five stages, the trackways, the making of the Roman road, the dark ages, wheeled traffic and the modern road, and the future.

The farmer's shop book, L. M. ROEHL (*Milwaukee: Bruce Pub. Co., 1923, pp. 432, figs. 131*).—This book has been prepared on the basis of the farm shop

work taught in the New York State College of Agriculture, and presents a very detailed description of the many features of this work, including a large number of both diagrammatic and photographic illustrations. It contains chapters on shop, household, field, stock, poultry, barn, orchard, crop, bee and bird, and playground appliances; farm buildings; hinges, locks, and builders' hardware, window repairing; bolts and rivets; drills, taps, and dies; vise work; metal work; attaching farm tool handles; saw filing and tool sharpening; ropework and tackle blocks; harness repairing and belt lacing; painting; and agricultural drawing.

A. S. M. E. boiler construction code, 1924 (*New York: Amer. Soc. Mechan. Engin., 1924, pp. [8]+198, pl. 1, figs. 42*).—Standard rules are presented for the construction of stationary steam boilers, which are known collectively as the A. S. M. E. boiler construction code formulated by the boiler committee of the American Society of Mechanical Engineers. These regulations deal with power boilers, material specifications, and rules for inspection.

Storage batteries, G. W. VINAL (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1924, pp. VIII+402, figs. 156*).—This is a general treatise on the physics and chemistry of secondary batteries and their engineering applications, and is based on the operations of the U. S. Bureau of Standards along this line. It contains chapters on materials and methods of construction; the electrolyte; theory of reactions, energy transformations, and voltage; capacity; operation; resistance; efficiency; testing storage batteries; and present-day uses for storage batteries.

Test of lubricating oils (*Washington: U. S. Navy Dept., Bur. Engin., 1924, pp. 17*).—Instructions for conducting service tests of lubricating oils in the laboratory, as practiced at the Engineering Experiment Station at Annapolis, Md., are presented.

The motor truck: Applied mechanics for owners and drivers, E. E. LA SCHUM and H. E. BARDWELL (*New York: U. P. C. Book Co., Inc., 1924, pp. XIII+325, figs. 69*).—This is a handbook of information for motor truck operators. It contains chapters on the field of the motor truck, the power plant, carburetors, electrical equipment, radiators, lubrication, fuel and heat, the chassis, running gear, performance, and record of performance and maintenance.

Engineering progress in general-purpose farm-tractor development, O. B. ZIMMERMAN (*Jour. Soc. Automotive Engin., 16 (1925), No. 1, pp. 47–52, figs. 10*).—Typical, early, and recent developments of the general-purpose farm tractor are reviewed. It is stated that the original steam-power equipment was intended to serve as a portable belt power unit, and was used almost entirely to operate threshing machines, many men and horses and various supplies being needed in addition.

Internal-combustion engines were utilized in farm tractors about 20 years ago for plowing and to supply belt power. Other operations such as disking, harrowing, and hauling loads on highways were attempted, but owing to the great weight of the equipment they gave little satisfaction. Engineering effort was directed about 10 years ago toward reducing the weight of tractors suitable for belt power and drawbar work, also to the improvement of equipment for use in connection with tractors. Power take-off, whereby power from the tractor-power plant is transmitted directly to the implement, resulted in greater mechanical simplicity and reduced the weight.

Major requirements in general-purpose tractor design are enumerated as adjustable ground clearance, proper width of wheels and of wheel spacing, and a short turning radius.

In summarizing the situation, it is stated that what originally started, roughly speaking, as a 20,000-lb. gasoline power unit now weighs about 3,300 lbs., and has a speed of 3 miles per hour or more, as compared with an original speed of less than 2 miles per hour. The present engine has available about 25 h. p., while the earlier engine was rated at about 60 h. p.

The homemade crib silo, E. W. Smith (*Minn. Univ. Agr. Ext. Spec. Bul. 78 (1923), pp. 8, figs. 8*).—Practical information on the planning and construction of the homemade crib silo adapted to Minnesota conditions is presented, together with working drawings.

The trench silo, a cheap means of storing feed, R. L. Strong (*N. Mex. Agr. Col. Ext. Circ. 75 (1923), pp. 14, figs. 5*).—Practical information on the planning and construction of trench silos adapted to New Mexico conditions is presented.

Mechanical refrigeration, H. Williams (*London: Isaac Pitman & Sons, Ltd., 1924, new and enl. ed., pp. X+501, pls. 6, figs. 169*).—This is a practical introduction to the study of cold storage, ice making, and other purposes to which refrigeration is applied. It contains chapters on general principles; the laws of fluids, heat, liquids, gases, and vapors; thermodynamics; historical data; the properties of ammonia, carbon dioxide, and other refrigerants; types of machines; the refrigerating plant; auxiliary plant; insulation; brine; ice making; cold storage; articles in cold storage; other applications; and the design of abattoirs and freezing and meat-packing works.

Further data on infiltration of air through building openings, C. C. Schrader (*Jour. Amer. Soc. Heating and Ventilating Engin., 31 (1925), No. 1, pp. 1–4, figs. 2*).—The results of further tests covering the leakage around doors and double casement windows are reported (E. S. R., 51, p. 790). The data presented serve to emphasize the fact that the application of weather stripping tends to minimize the individual or combined effects of size of cracks around openings, wind velocity, and outside temperature on the heating requirements.

Domestic sanitation and house drainage, H. C. Adams (*London: Henry Frowde and Hodder & Stoughton, 1923, pp. XV+227, figs. 193*).—This is one of the Oxford Technical Publications and consists of a large number of lectures presented to students by the author on sanitary science, particularly as applied to the household and to animal shelters. Chapters are included on building sites; sanitary building construction; house drains; drainage materials and fittings; construction of drains; soil and waste pipes; ventilation of drains; water-closets and slop sinks; baths, lavatories, and sinks; institution and school sanitation; cast-iron drainage; stables and cow sheds; drain flushing and cleaning; drain testing; planning drainage systems; conservancy systems; house refuse; drainage law; water services; lighting and illumination; warming; ventilation; and sanitary surveys.

Home sewage disposal, W. A. Hardenbergh (*Philadelphia and London: J. B. Lippincott Co., 1924, pp. VII+274, figs. 82*).—This handbook has been prepared for use by health officers in the field and to furnish data for engineers interested in sewage disposal for single homes, small communities, and institutions. An insight into the purpose and problems underlying sewage disposal in its relation to health work is also given.

It is divided into four parts. Part 1 contains chapters on the need for and results of sanitation, the principles of sanitation, chemical and bacteriological processes during sewage treatment, and selecting the method of disposal;

part 2, on sewage disposal for unsewered sections, contains chapters on the pit privy, the double-compartment concrete vault, the box and can privy, the septic closet, the chemical closet, and the disposal of excreta; part 3, on the treatment of sewage, contains chapters on the small septic tank, small Imhoff tanks, other means of treatment, and secondary treatment of sewage; and part 4, dealing with problems in field sanitation, contains chapters on construction details, soil and water pollution, and flies and the filth-borne diseases. An appendix on ordinances and specifications is included.

RURAL ECONOMICS AND SOCIOLOGY

The economic position of the American farmer, W. R. INGALLS (*In Current Economic Affairs. York, Pa.: G. H. Merlin Co., 1924, pp. 43–58*).—This is a chapter from a collection of addresses and papers dealing with the distribution of wealth among the classes of people in the United States.

The American farmer is said to be a capitalist, in that he is the owner of land or implements. The internal economic unbalance, which has given the wage earners the greater share of the produce of industry at the expense of the capitalists, diminishes the share of the national income that can be devoted to the upkeep of the principal in the case of the farmer just as in that of other capitalists. In his case, soil fertility, buildings, and equipment have necessarily been allowed to deteriorate. The farmer is urged to watch and abide the operation of economic forces, though it is suggested that he might curtail his operation of automobiles and take a firm position in favor of the removal of certain economic restrictions, which are discussed in subsequent chapters of the author's book as including our present high tariff rates, restriction upon immigration, heavily increased surtaxes and an unjust system of levying and collecting income taxes, restrictions upon the operation of railroads, and legislative restrictions for excluding competitive labor in times of strikes and certain customs and practices of labor unions.

[Report of the Indiana Station] department of farm management (*Indiana Sta. Rpt. 1924, pp. 27, 28, figs. 2*).—The conclusions reached from a 5-year study of the cost of producing beef cattle in Indiana are summarized. In 2 of the 5 years from 1918–19 to 1922–23 a profit was realized. In 1921–22, 70 cts. was returned for corn worth 42 cts. a bushel, and in 1922–23, 89 cts. was realized on 66-ct. corn. In 1920–21 the average loss per head was $21.55, 11 cts. per bushel having been returned for corn worth 54 cts. at the farm.

Relation of farm land income to farm land value, C. R. CHAMBERS (*Amer. Econ. Rev., 14 (1924), No. 4, pp. 673–698, figs. 3*).—Portions of the data presented in U. S. D. A. Bulletin 1224 (E. S. R., 51, p. 593) are presented here and discussed further.

Tenure and farm investment in Nebraska, J. O. RANKIN (*Nebraska Sta. Bul. 205 (1925), pp. 36, figs. 5*).—The investment in about 1,000 farm businesses in southeastern and central Nebraska, surveyed as previously noted (E. S. R., 49, p. 189), is analyzed to indicate the amount and kind of investment per farm or per 100 acres by farmers in certain tenure groups.

About 87 per cent of the investment of 1,034 farms was in real estate, 6 per cent in livestock, 3 per cent in implements, and 1 per cent each in funds on hand, unsold crops, growing crops, and feed, seed, and other items. The investment in real estate was nine-tenths of the total on tenant farms. Owners had one and one-half times as great livestock investment per farm as tenants and slightly greater than part owners. The equipment per 100 acres averaged $2,960 among owners and about $2,200 among part owners and tenants, but varied greatly with the type of farming.

Land reform in Finland, 1922 (*Helsingfors: Govt., 1923, pp. 15*).—This is an official statement reviewing the position of the rural population in Finland, and setting forth the main features of the law of November 25, 1922, providing land for the purposes of colonization.

Field and crop labor on Georgia farms (Coastal Plain area), L. A. Reynoldson (*U. S. Dept. Agr. Bul. 1292 (1925), pp. 28, figs. 11*).—Data obtained by personal interviews from about 600 farmers in the Coastal Plain area of Georgia are summarized and graphically presented, showing the acreages and yields of the crops grown; the average time used by men and mules in different sized crews, with different implements, width of rows, and number of furrows for various field and crop operations; the hours per day and the days per month available for field work; and the dates of performing different operations with cotton, corn, peanuts, sweet potatoes, sugar cane, cowpeas, watermelons, oats, wheat, and rye.

Farm accounts, C. S. Orwin (*Cambridge: Univ. Press, 1924, 2. ed., rev., pp. [6]+140*).—A manual previously noted (E. S. R., 33, p. 92) has been completely revised, new farm accounts are substituted for the ones used as examples in the earlier edition, and interest on capital is excluded as an item of cost.

The organization of agriculture in relation to the problem of price stabilization, I, II, W. R. Camp (*Jour. Polit. Econ., 32 (1924), Nos. 3, pp. 282–314; 4, pp. 441–467*).—The methods of marketing farm products and of financing agricultural production which have been followed by two typical California organizations held to occupy positions of leadership as distributors of farm products are analyzed here in the effort to determine in how far such methods may be said to be factors in determining the rate of change of prices of farm products. It is attempted further to show how the present movement for the organization of the producers of farm products may be considered as one of the essential elements of the stabilization of prices in general and a factor in the stabilization of living expenses, wages, and industrial costs in general.

The California Fruit Growers Exchange is said to have distributed citrus fruit to the jobbers so uniformly throughout the United States that the price to the jobbers tends to be equalized in all the markets for the same grade at any given time. Stabilization of prices is based upon the regulation by the exchange of the flow from the groves to the markets. The system made possible the distribution for the growers of the largest crop of citrus fruit ever produced in California during a year of depression and at prices which are said to have assured most of the growers the cost of production or better. The competitive forces that determine the modern market are traced in connection with the detailed account of the raisin industry and the organization of growers and packers. During 1920–21, when most farm products underwent a collapse in values, raisins were sold at a price which realized more to the growers than during 1919, the year when the wholesale price of raisins was highest.

The bearing of credit extension and contraction upon agricultural organization and price stabilization is discussed. The large scale borrowing of the cooperative marketing associations substituted for the more expensive borrowing of small amounts by individual growers is considered one of the principal achievements of the cooperative marketing associations. Some of the main problems involved in the extension of the movement to products such as wheat and cotton are pointed out, and certain elements in the instability of prices, due either to varying degrees of effectiveness of organization or to the complete absence of it, are then analyzed.

Report of the Federal Trade Commission on the grain trade, III, IV, N. B. Gaskill, V. Murdock, et al. (*Washington: Govt., 1922, vol. 3, pp. XIX+332; 1924, vol. 4, pp. XXXIII+215, fig. 1*).—Two reports are submitted as parts of the report of investigations previously noted (E. S. R., 46, p. 290).

Volume 3. *Terminal grain marketing.*—This volume embodies the conclusions and recommendations of the commission with reference to the marketing of cash grain. Certain changes are deemed desirable for the grain business, particularly at terminal markets. These include improved banking arrangements for the grain movement in the Northwest, the elimination of financing of commission houses by terminal elevators wherever it may appear, the operation of public terminal elevators by railroad companies as an adjunct to the transportation service, improvement in the methods of making up cash quotations, the elimination or reduction of so-called insurance charges levied on country shippers at the Duluth market, the adoption of some form of governmental supervision of privately issued country price reports of wide circulation such as the Grain Bulletin card, and the prohibition of cash grain scalping by concerns acting directly or indirectly as commission men or receivers.

Volume 4. *Middlemen's profits and margins.*—A report is made covering the costs, profits, and margins in the handling of grain, the first part of which presents facts regarding the expenses and profits of country elevators, and the second similar facts regarding terminal elevators, while the third estimates the gross margin in the handling of grain between the producer and the exporter, miller, or other converter. The financial results of the operations of country elevators of the commercial line, independent, and cooperative types are presented. The results for the cooperative and independent elevators cover six years, 1913–14 to 1917–18 and 1919–20. The results for the line elevators are given for the same years with the exception of 1917–18.

The cooperative elevators obtained on the average the largest gross revenue from the sale of grain. The explanation of their narrower gross profit is said to lie apparently in the volume of grain sold. Their operating expenses were on the average above those of the independent elevators in only three years out of six, while the average investment of the cooperative was lower than that of the independent, except in 1919–20. The line elevators showed both a small operating expense and a small investment as compared with either the independent or the cooperative elevators.

Data as to the margins per bushel and profits on investment were obtained for a number of representative companies in the chief terminal markets. For 10 of these companies comparative figures are available for the years 1912–13 to 1916–17 and for 1919–20. The maximum average annual gross margin, before the inclusion of hedge gains or losses, for these 10 identical companies was 19.77 cts. per bushel and for all companies studied 15.37 cts. The minimum was only 1.79 cts. per bushel.

An estimate was made of the average spreads between the producer on the one hand and the converter, exporter, retail feed dealer, and others on the other hand for wheat, corn, and oats as of the period 1912–13 to 1916–17 and for the year 1919–20. Between the first-mentioned dates the total estimated average spread was 24.71 cts. per bushel on wheat, 17.22 cts. on corn, and 14.88 cts. on oats. These were found to be divided about evenly between the transportation companies and the middlemen handling the grain. In 1919–20 there was a sharp advance in the wheat spread to 33.20 cts. per bushel. There was practically no change in the corn spread, and the total oats spread advanced from 14.88 cts. per bushel to 17.14 cts. A reduction at all points is deemed desirable.

The organization of livestock marketing in France, P. SEIGNOLLE (*Organisation du Marché du Bétail Vivant en France. Toulouse: E. H. Guitard, 1923, pp. 200, fig. 1*).—The first part of this study (pp. 13–142), describes in general the machinery operating throughout France for marketing livestock. A large central market in Paris, known as the market of the Villette, is described in detail. Its organization and methods are said to be archaic and in need of reform. A nation-wide system for circulating market information and the establishment of regional cooperative abattoirs are recommended as means of improving the situation. Part 2 presents a review of prices of live animals and meat products, showing the rise since 1900. Part 3 discusses briefly the foreign trade of France in livestock and livestock products.

Crop reporting in India, D. N. GHOSH (*Agr. Jour. India, 19 (1924), No. 5, pp. 460–472*).—The method of estimating the yield in forecasting crops in India is set forth as based upon the area, the standard normal output per acre, and the condition estimate. The defects of the present system are pointed out and suggestions for improvement are made. It is recommended that more attention be paid to the system of crop-cutting experiments in determining the standard normal output, and that as soon as figures on which sufficient reliance may be put are available for a series of years a method involving the formula

$$\text{Total yield} = \text{area} \times \text{average of } \frac{\text{actual yield}}{\text{area}} \times \frac{\text{seasonal factor}}{\text{average seasonal factor}}$$

be used in correcting the condition estimate. Methods in vogue in the United States and Egypt are briefly described.

Proceedings (revised) of the select special committee of the House of Commons to inquire into agricultural conditions, A. R. MCMASTER ET AL. (*Ottawa: Govt., 1924, pts. 1, pp. LXXII+1083+62, figs. 4; 2, pp. IV+1085–2193+62, figs. 10*).—The orders of reference, seven reports, minutes of the proceedings of, and the evidence given before the special committee appointed in 1923 to inquire into agricultural conditions throughout Canada are published as Appendix No. 3 to the Journals of the House of Commons.

The agrarian revolution in Russia (*Washington, D. C.: Russian Inform. Bur., 1924, pp. 38*).—The agrarian situation in Russia on the eve of the revolution of 1917 and the attitude of the peasants toward the revolution and land reform are presented in general outline. In describing the redistribution of the land it is noted that the Soviet estates, or those estates that rose up spontaneously as the peasants dispossessed the landowners, were recognized by legislation, and they continued to be conducted on previous lines under State ownership. Another form of collective farming was the agricultural commune, the essential feature of which was that the product belonged to the individual producer, while the means of production were the property of the State. The profits derived from the use of the communal implements and stock were devoted to the purpose of improving and expanding the estate.

A new economic policy with regard to rewarding the individual cultivator was adopted in 1921. The grain levy was abolished, and a grain tax was introduced to take the place of all petty taxes which had hitherto been assessed. The new system left to the peasant a margin of surplus produce which he could dispose of in the open market. The Russian agrarian system continues to be based on State ownership of the land and the total prohibition of any and all transactions therein. The system of granting specific credits for the cultivation of desirable crops, such as flax, cotton, sugar beets, and others, gives the State the power to control their selection.

The agrarian question in Russia, E. SCHKAFF (*La Question Agraire en Russie. Paris: Libr. Arthur Rousseau, 1922, pp. XIII+336*).—The author pre-

sents a history of the subjugation of the Russian peasant with the development of the feudal system and imperial ambitions. The first part of the volume covers medieval times, the accumulation of capital through commerce, and some of the early economic causes that led eventually to the peasant emancipation. The second part covers a period between the abolition of serfdom in 1861 and the revolution in 1917. The history and effects of the development of capitalism in agriculture are discussed, together with the genesis of agrarian classes, the emigration of peasants to Siberia, and other phases of the agrarian question. The third part is devoted to the agrarian theories of the socialists and agrarian policies of the Soviet Government (1917–1922). Experiments in collective farming are described, and the temporary demoralization of agriculture is explained. The text of the law socializing the land which was passed by the Third All Russian Congress of the Soviets February 19, 1918, is given in the appendix. An extensive bibliography is added.

Agriculture in Rumania [trans. title], L. Blank (*Rev. Écon. Internatl., 16 (1924), IV, No. 1, pp. 38–68*).—A summary and review of statistics of agricultural production and trade and landholding in Rumania, principally in war and postwar years, are given in these pages, together with a discussion of the relations between peasants and large proprietors before the war. The effect of the war on agriculture is pointed out, and the legislative measures taken and projected for the improvement of agricultural production are noted.

The application of agrarian laws in Rumania [trans. title], M. Peyre (*Rev. Écon. Internatl., 16 (1924), IV, No. 1, pp. 69–79*).—Agrarian legislation preceding the law of 1921, which provided for the partition of large holdings, is briefly noted. The Central Savings and Credit Institution has been created, and its administration, together with that of the new agrarian cooperative system as a whole, has been given over to the peasants. Large holdings have been broken up and the reform is held to have brought about better crop yields, increased production, and the improvement of the condition of the peasants.

The problem of social insurance in agriculture, A. Jacquemont (*Le Problème des Assurances Sociales en Agriculture. Paris: "Éditions Spes," 1923, pp. 244*).—This is a study of the living conditions of the rural laborer in France and an examination of the structure of agrarian classes and their social needs, made in connection with a bill relating to social insurance.

Rural planning—the village, W. C. Nason (*U. S. Dept. Agr., Farmer's Bul. 1441 (1925), pp. II+46, figs. 49*).—Herewith are given instances of what has been accomplished in numerous villages in many States, as well as some indication of the importance of village planning and the facility with which valuable results may be attained.

AGRICULTURAL EDUCATION

Agricultural education in British universities (*School and Soc., 21 (1925), No. 545, p. 675*).—A brief account is given of the discussion of this topic at the annual conference of the universities of Great Britain and Ireland held at King's College, London.

Agricultural education [in India, 1923–24] (*India [Dept. Agr.] Rev. Agr. Oper., 1923–24, pp. 73–78, pls. 3*).—Brief notes are given pertaining to the progress of agricultural teaching at institutions of several grades, continuing a series of reports previously noted (E. S. R., 51, p. 299).

Laboratory work in rural social problems, B. L. Melvin (*Jour. Social Forces, 3 (1925), No. 2, pp. 261–263*).—Laboratory work in this subject is held to have the two aspects of field work, wherein actual surveys may be made

either of the student's home community or of some other place, and directed studies of statistical and other data in a room adapted to that purpose. Sample outlines and exercises are given.

The rural high school: Its organization and curriculum, E. N. FERRISS (*U. S. Bur. Ed. Bul. 10 (1925), pp. VI+74*).—This is the first of a series of studies to be devoted to the small high school and its problems. Questionnaire returns were assembled by the Bureau of Education from 231 principals of rural high schools in 47 States, and the author gathered, by personal visitation, data for 54 schools in 18 States. Some additional information was made use of.

The analysis of this statistical material is centered upon the internal organization of the rural high school, its cooperative relationship with the community through community organizations, the nature and extent of its extra classroom activities, and the nature and variety of its curricula. Certain of the problems of rural secondary education which arise out of the smallness of the rural and semirural high schools are emphasized. The teaching load is found to be heavy and programs involving the alternation of subjects are suggested, together with other means of reducing it. The necessity of providing transportation facilities for all pupils attending the central high school from the coordinating schools is pointed out. The problem of adequate supervision and encouragement of professional growth of high school teachers is said to be a serious one. There is need of educational and vocational guidance of pupils. Two types of extra classroom activities are desirable: Those combining educational and social aims, such as literary, dramatic, and debating societies, glee clubs, orchestras, and other organizations, and those mainly social, such as school and class parties. Suggestions are made for improving the curriculum offerings.

Cost account book one [and two], [N. J.] LENNES and [A. S.] MERRILL (*New York: Macmillan Co., 1925 [I] pp. 51; [II], pp. 96*).—Blanks are provided for laboratory work and exercises to be used in connection with certain parts of a text previously noted (E. S. R., 50, p. 898).

Financial account book, [N. J.] LENNES and [A. S.] MERRILL (*New York: Macmillan Co., 1925, pp. 64*).—Sample blanks and pages for exercises are given to accompany the text noted in the above.

Inventory account book, [N. J.] LENNES and [A. S.] MERRILL (*New York: Macmillan Co., 1925, pp. 48*).—This exercise book also accompanies the text noted above.

MISCELLANEOUS

The Thirty-seventh Annual Report of the Colorado Agricultural Experiment Station for the Year 1924, C. P. GILLETTE ET AL. (*Colorado Sta. Rpt. 1924, pp. 42, fig 1*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, a report of the director on the work of the station, and departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report of [Indiana Station], 1924, G. I. CHRISTIE and H. J. REED (*Indiana Sta. Rpt. 1924, pp. 64, figs. 35*).—This contains the organization list, a report of the director summarizing the activities of the station, publications of the year, changes in staff, etc., and a financial statement for the Federal funds for the fiscal year ended June 30, 1924, and for the remaining funds for the fiscal year ended September 30, 1924. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of Northwest Experiment Station, Crookston, 1923, C. G. SELVIG ET AL. (*Minnesota Sta., Crookston Substa. Rpt. 1923, pp. 113, figs. 8*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of West Central Experiment Station, Morris, 1923, P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1923, pp. 49*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report from Holly Springs Branch Experiment Station for 1924, C. T. AMES (*Mississippi Sta. Bul. 223 (1924), pp. 25, fig. 1*).—The work of this substation is briefly summarized. In addition to work with field crops noted on page 131, notes are given on controlling soil washing, apple growing, dairying, and the use of lime in this region.

Thirty-fifth Annual Report [of New Mexico Station, 1924], F. GARCIA (*New Mexico Sta. Rpt. 1923, pp. 55, figs. 2*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the year ended June 30, 1924. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Northern Great Plains Field Station for the 10-year period 1913–1922, inclusive, J. M. STEPHENS ET AL. (*U. S. Dept. Agr. Bul. 1301 (1925), pp. 80, figs. 10*).—The experimental work reported from this station, located near Mandan, N. Dak., is for the most part abstracted elsewhere in this issue.

New information for Oklahoma farmers: A Biennial Report of the Oklahoma Agricultural Experiment Station for 1922–1924, C. T. DOWELL ET AL. (*Oklahoma Sta. Bien. Rpt. 1923–24, pp. 38, figs. 3*).—This, a report of the station for the biennium ended June 30, 1924, contains a financial statement for this period and a report of the director and the various departments. The experimental work reported is for the most part abstracted elsewhere in this issue. An analysis of the seeds of the stinging nettle (*Jatropha stimulosa*) is included.

Annual Report of [Porto Rico Insular Station, 1924], R. MENÉNDEZ RAMOS ET AL. (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1924, pp. 106, pls. 15; also Spanish ed., pp. 120, figs. 16*).—This contains the organization list, a report by the director for the fiscal year ended June 30, 1924, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Some results from agricultural stations over the State, from 1923 report, W. L. QUAYLE (*Wyoming Sta. State Farms Bul. 4 (1923), pp. 14, figs. 3*).—In addition to work with field crops, noted on page 133, notes are given on shade trees, fruits, and feeding trails with dairy cattle, steers, and hogs.

The service of the State experiment farms, W. L. QUAYLE (*Wyoming Sta. State Farms Bul. 5 (1925), pp. 68, figs. 33*).—This bulletin discusses the organization, accomplishments, and needs of the experimental work conducted at the various State farms, located at Archer, Laramie County; Eden, Sweetwater County; Gillette, Campbell County; Grover, Lincoln County; Jireh, Niobrara County; Lander, Fremont County; Lyman, Uinta County; Sheridan, Sheridan County; Torrington, Goshen County; and Worland, Washakie County.

NOTES

Florida Station.—Action by the Florida Legislature at its recent session has enabled the station to secure 320 acres of excellent land adjoining its present farm at Gainesville. A tract of 17 acres adjoining the Tobacco Substation at Quincy has also been purchased and added to the lands available at that point. Dr. W. B. Tisdale, associate plant pathologist, has been given charge of the substation.

A department of veterinary science was established in the station by the last legislature. Dr. A. L. Sheely, professor of veterinary science in the university, has also been appointed head of the department, and Dr. W. A. Sanders, assistant veterinarian.

The cotton investigations in Florida heretofore in charge of the State Plant Board were transferred to the station July 1, together with the personnel engaged in this work, consisting of Dr. A. F. Camp, plant physiologist, Geo. D. Smith, associate entomologist, and Paul W. Calhoun and Raymond Crown, field assistants. The investigations, already dealing with studies of cotton diseases and boll weevil control, are to be enlarged to include cotton breeding work and fertilizer tests. Dr. W. A. Carver has been appointed assistant cotton specialist and will take up the breeding work immediately.

Dr. E. D. Ball, Director of Scientific Work of the U. S. Department of Agriculture, has accepted an appointment as associate entomologist of the State Plant Board and beginning August 1 will engage in an investigation of the celery leaf-tyer and other insects at Sanford and elsewhere. This work is carried on as a cooperative project by the State Plant Board and the station and the Bureaus of Plant Industry and Entomology of the U. S. Department of Agriculture. W. H. Thompson, until recently assistant entomologist in the citrus aphis investigations of the State Plant Board, has been appointed assistant entomologist of the station. Archie N. Tissot has also been appointed assistant entomologist vice A. H. Beyer, who has resigned to take up graduate work.

Dr. W. A. Kuntz, until recently assistant plant pathologist of the State Plant Board, has been apointed assistant plant pathologist of the station and assigned to work in connection with the tomato disease investigations which are being conducted in cooperation with the Bureau of Plant Industry. Other appointments include Dr. R. M. Barnette, assistant soil chemist in the Tennessee Station, as assistant chemist in soil investigations, and Dr. Walter A. Leukel as assistant in grass and forage crop investigations.

Kansas College and Station.—Dr. J. H. Merrill, associate professor of entomology, assistant in fruit insect investigations, and State apiarist, resigned July 1 to take charge of a commercial enterprise in fruit and honey production in Massachusetts.

Louisiana University and Stations.—Dr. Wm. H. Dalrymple, professor of veterinary science and associate director and veterinarian of the stations, died July 17 at the age of 69 years.

Doctor Dalrymple was born and educated in Scotland, graduating from the Glasgow Veterinary College in 1886 and coming to Louisiana in 1889 as professor of comparative medicine and veterinarian. In 1893 he resigned to

engage in private practice, but resumed his position in 1897. From 1920 to 1921 he served as dean of the agricultural college and director of the stations, relinquishing these duties because of ill health but retaining his veterinary work until his death.

A pioneer leader in livestock development and veterinary science, Doctor Dalrymple in the past 35 years exercised a broad influence in the promotion of agriculture in Louisiana and the adjoining regions. He was largely responsible for the organization of the Louisiana Live Stock Sanitary Board, of which he was a member, and an early and active advocate of the tick-eradication campaign. He was the author of Livestock Sanitation, issued in 1893, and Veterinary Obstetrics, published in 1896, and of many bulletins and addresses. He had served as president of the U. S. Experiment Station Veterinary Medical Association in 1901–2, the American Veterinary Medical Association in 1907–8, and the U. S. Live Stock Sanitary Association in 1908–9, as well as editor of the *Journal of the American Veterinary Medical Association* in 1918–19, and was connected with many other organizations.

Maine University.—President C. C. Little has resigned, effective September 1, to become president of the University of Michigan.

Massachusetts College.—Leon R. Quinlan has been appointed to succeed Prentiss French as assistant professor of landscape gardening. M. J. Markuson, assistant professor and extension assistant in agricultural engineering at the Virginia College, has been appointed assistant professor of rural engineering vice Jas. L. Strahan, resigned.

Mississippi College and Station.—Dr. B. M. Walker, vice president of the college, succeeded D. C. Hull as president on July 1. J. N. Lipscomb has resigned as agricultural economist to become dean of the school of agriculture. Lewis E. Long has been appointed research economist, and R. H. Smith research chemist in the station. Dr. K. U. Jones, veterinarian, has resigned.

Missouri University and Station.—Dr. N. B. Guerrant, assistant in agricultural chemistry, has accepted an appointment in the department of chemistry in the Oklahoma College, effective August 1.

New Hampshire Station.—Ford S. Prince, formerly assistant agronomist and more recently county agent at Xenia, Ohio, has been appointed research and extension specialist in soils and crops.

Cornell University and Station.—Work has begun on moving the buildings of the department of rural engineering preparatory to erecting the new library and plant industry buildings.

Dr. Wilford M. Wilson, professor of meteorology and head of the Weather Bureau station for 19 years, retired as professor of meteorology but retains his position as meteorologist and section director of the Weather Bureau. *Science* notes that Dr. Ivan C. Hall, professor of bacteriology, has been appointed head of the department of bacteriology and public health in the new University of Colorado Medical School.

New York State Station.—About 20 nurserymen from New York, Ohio, Canada, Pennsylvania, and Missouri attended a two-weeks course in July for a special study of the method of variety identification of tree fruits by leaf characteristics originated by the Massachusetts Station. A series of lectures occupied the morning sessions, and the afternoons were devoted to field work.

The 12 or more distinct steps involved in the development of a new variety of fruit will be shown as an important feature of the station's prospective horticultural exhibit at the State fair. Each of the steps will be depicted by means of greatly enlarged photographs, including the bagging of the fruit blossoms early in the spring, the transfer of pollen from the selected male

parent of the cross to the female, the protection of the fertilized fruit bud from foreign pollen, the preservation of the seed obtained from the fruit of the cross, the propagation of the seedlings, and other intermediate stages. If the season is favorable, it is also hoped to show the results of some of these crosses in the shape of some of the new fruits themselves, particularly of the best of the new varieties.

Provision has been made recently for the inauguration of new lines of investigation of bacterial fermentation. These will involve a study of methods for hastening desirable changes in food products, such as the fermentation of sauerkraut, or for preventing undesirable activities which lead to food spoilage. The prevention of spoilage in tomato pulp and other tomato products, improvement in the quality of silage, and problems in the manufacture of vinegar and the production of pickles are special phases of the problem awaiting investigation.

North Carolina Station.—Dr. R. Y. Winters, professor of plant breeding and in charge of plant breeding work, has been appointed director.

Ohio Station.—The station has been granted appropriations by the State Legislature for the biennium beginning July 1, aggregating $1,121,900. This includes $521,900 for personal services, $284,000 for total maintenance, $119,000 for additions and betterments, $69,000 for forestry maintenance work, and $128,000 for forestry additions and betterments. These appropriations exceed those of the preceding biennium by 17 per cent.

Pennsylvania College and Station.—Dr. Hannah E. Honeywell has been appointed assistant professor of biological chemistry in the School of Agriculture and station.

Rhode Island Station.—Nelson F. Waters has been appointed assistant in animal breeding and pathology, and Leo J. Hardin assistant in chemistry.

Texas College.—According to a note in *The Breeder's Gazette*, Dr. R. H. Williams, formerly head of the animal husbandry department at the Arizona University and Station, has been appointed professor of animal husbandry vice W. L. Stangel, who has accepted a position as head of the Texas Technological College. Dr. A. K. Mackey has succeeded, as assistant professor of animal husbandry, D. S. Buchanan, who has been given a year's leave of absence under a fellowship at the Iowa College.

Washington College and Station.—A new dairy manufactures building, funds for the completion of which were appropriated at the last session of the legislature, is under construction. The contracts call for its completion and equipment by January 15, 1926, at a cost of approximately $275,000.

The beef cattle barn which was burned last fall has been replaced with a barn of the same size and almost identical in plan.

The division of farm management has been enlarged and renamed the division of farm management and agricultural economics, with Vice-dean Geo. Severance as head. Neil W. Johnson has been appointed research assistant in farm management in the division; G. H. Fredell, research assistant in agricultural economics; and Edward A. Taylor, research fellow in rural sociology. E. F. Dummeier, assistant professor of agricultural economics, has been given a year's leave of absence for graduate study at the University of Chicago.

Harry Jensen has been appointed assistant horticulturist and assigned to the Irrigation Substation at Prosser.

Wisconsin University and Station.—The annual Station Day this year emphasized especially the results of laboratory research, the usual field trips and plat demonstrations being omitted. For the first time the event was held

on the same day as Commencement, and many of the visitors thus had the opportunity to remain for these impressive exercises. The attendance on the whole was very satisfactory, a thousand people being seated in the stock pavilion for an ultraviolet light demonstration which was given. A large number also attended the women's program, which was held in the home economics building.

Recent work indicates that mosaic diseases can be classified into different types, and that they apparently result from the action of different kinds of viruses. Tobacco plants were inoculated with viruses from different sources by means of needle punctures. Besides the tobacco mosaic four other types of mosaic are found capable of development in the tobacco plant—cucumber mosaic, petunia mosaic, speckled mosaic, and mild mosaic.

Dean and Director H. L. Russell has been granted a year's leave of absence to study educational conditions in the Far East as the representative of the International Education Board. He will sail in September and visit among other countries Japan, China, the Philippines, Australia, and New Zealand.

Dr. L. R. Jones, chairman of the department of botany, was recently elected president of the board of trustees of the Tropical Research Foundation.

Dr. Karl P. Link, who received his doctor's degree in agricultural chemistry at the university in June, has been awarded a fellowship by the International Education Board, to enable him to carry on his studies in carbohydrate chemistry at St. Andrews University, Scotland.

Wyoming University and Station.—T. J. Dunnewald has been added to the staff of the agronomy department as director of soil survey work, and will undertake a survey of the North Platte section in connection with a proposed reclamation project in the Saratoga district. Lew P. Reeve, assistant professor of animal husbandry and assistant animal husbandman, has resigned to accept a commercial position in Minnesota, and will be succeeded by S. S. Wheeler, instructor and junior animal husbandman in the West Virginia University and Station.

Agriculture at the Third Pan-Pacific Science Congress.—Announcement is made that this congress will meet in Tokyo from October 25 to November 18, 1926, under the auspices of the Japanese National Research Council. Among the subjects suggested for discussion which are of interest to agriculture are the following: Scientific bases for plant quarantine in the countries of the Pacific; genetics in relation to the improvement of important crops, more particularly rice, and of livestock; arrangements for information regarding the insect faunas of the Pacific region, especially those affecting economic plants and animals; rational method of storing cereals; distribution of volcanic ashes in the Pacific region and their physical and chemical characters, with special reference to their agricultural value; use of green manures in various Pacific regions; and control and treatment of infectious and parasitological diseases in livestock.

New Journals.—*Acta Pathologica et Microbiologica Scandinavica* is being published as the official organ of the pathological societies of Denmark, Sweden, Norway, and Finland. The papers will be published in English, French, or German, and "are intended to link up other countries with Scandinavia and apprise them of the scientific work accomplished within general pathology, pathological physiology and anatomy, medical microbiology, serology, veterinary, and comparative pathology." In addition to original papers, the periodical will contain abstracts of Scandinavian work published elsewhere and accounts of meetings of the Northern Pathological Society.

Quarterly Journal of the Indian Chemical Society is being issued by the council of the Indian Chemical Society. The initial number consists of 13 original articles, mainly in the field of pure chemistry, but one of which is entitled Friction Tests on Oils for Use on Motor Car Engines, by E. R. Watson and H. M. Mulany.

First Bulletin of the Research Association of British Flour-Millers was issued in September, 1924. It contained a report of the director of research of the association and an article entitled The Function and Scope of the Information Bureau of the Research Association of British Flour-Millers, by C. R. Jones.

Tropical Woods is being issued from time to time by the School of Forestry of Yale University. The initial number contains several brief articles based on field explorations by members of the school staff in the West Indies, Central America, Colombia, Venezuela, the Guianas, and Brazil.

The *Allahabad Farmer* is being published quarterly by the staff and student body of the Allahabad Agricultural Institute as its official organ. The initial number contains a brief account of the institute, by Sam Higginbottom, and numerous short articles, among them one on Agricultural Cooperation in India.

Wheat Studies of the Food Research Institute is a series designed to give an impartial review of the world's wheat position and outlook. It is expected that the first volume will contain at least 10 issues, to be sent out from time to time and covering various phases of the wheat situation.

Chemische Rundschau für Mitteleuropa und Balkan is being published semimonthly at Budapest as the organ of the Hungarian Chemical Association. The initial number contains several short original articles, together with announcements, abstracts, and notes.

Child Health Bulletin is being published by the American Child Health Association. The initial number, that of March, 1925, contains among other material an article by Dr. Geo. T. Palmer, entitled Weight and Height as an Index of Nutrition in Infants, and a Child Health Bibliography.

Journal of Medical Research has been rechristened *The American Journal of Pathology* and is being issued bimonthly by the American Association of Pathologists and Bacteriologists.

Miscellaneous.—The Edinburgh and East of Scotland College of Agriculture Experimental Farm at Boghall, Milton Bridge, Midlothian, was formally opened July 18 by Sir John Gilmour, Secretary for Scotland. The farm was purchased in 1922 and contains about 600 acres, of which 230 are arable. Several new farm buildings have been erected, and experiments are under way with calf feeding and the crossing of alfalfa, potatoes, oats, and other crops.

The Evaporated Milk Association has given two fellowships to the University of Chicago, one of $1,500 to the home economics department for studying the availability of calcium and other minerals, and the other to the department of hygiene and bacteriology for work with vitamin C.

The new plant pathology laboratories at the Rothamsted Experimental Station were formally opened by Lord Bledisloe on June 18.

Horace Barton, professor of animal husbandry at Macdonald College, has been appointed dean of the faculty of agriculture in that college.

EXPERIMENT STATION RECORD

VOL. 53 AUGUST ABSTRACT NUMBER No. 3

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Investigations on the occurrence of iodine in nature, II–IX [trans. title] (*Biochem. Ztschr., 152 (1924), No. 1–2, pp. 116–190, figs. 2*).—In continuation of the investigation previously noted (E. S. R., 50, p. 608), eight papers are presented.

II. *Determination of minute amounts of iodine*, T. von Fellenberg (pp. 116–127).—Slight modifications in the method of determining iodine described in the first paper are noted, and the technique is given in detail for the determination in water, salt, rocks, and soil, plant and animal materials, glandular organs, and the urine. It is noted that the methods described by McClendon (E. S. R., 52, p. 712) have been tried but not adopted on account of the length of time required and the expense of the apparatus. The colorimetric method is used for very small amounts and the volumetric method for larger amounts.

III. *Iodine determinations in foods, fertilizers, and Swiss mineral waters*, T. von Fellenberg (pp. 128–131).—Tabulated data are reported on the iodine content of various cereal grains, legumes, fruits, mushrooms, animal and vegetable oils, nuts, cocoa and chocolate, tea and other similar beverages, artificial fertilizers, and mineral water. The data are reported as γ iodine per kilogram, γ signifying a millionth of a gram.

The iodine content of seeds and legumes varied from 8 to 64 γ per kilogram, and of fruits (lemons, oranges, bananas, raisins, and prunes) from 6 to 120 γ, the largest amounts being found in the raisins and prunes. Two samples of cod liver oil yielded 5,100 and 5,640 γ, respectively, while the vegetable oils ranged from 30 to 95 γ. Of the nuts, Spanish peanuts had the highest content, 200 γ. The iodine content of the extract of black Ceylon tea was 80 γ and of green tea 45 γ. Of the artificial fertilizers, Chile saltpeter had by far the highest content. A sample which had been stored for some time had a content of 49,000 γ and a fresh sample one of 192,000. Calcium cyanamide yielded only 40 γ. The mineral waters were of widely differing iodine content, from 11.6 to 6,310 γ.

IV. *The elimination of iodine from sea water*, T. von Fellenberg (pp. 132–134).—To determine whether sea water actually gives off iodine to the air, samples of sea water from Capri and the Isle of Wight were analyzed for soluble and insoluble iodine and were then kept for stated lengths of time in desiccators with and without air and in the light and dark, respectively, after which analyses were again made. The amount of iodine lost in the desiccators

without air was insignificant, but from 2 to 8 per cent was lost in the desiccators with air. Light and darkness appeared to have no effect.

V. *Studies on the iodine content of the air*, T. von Fellenberg (pp. 135–140).—Determinations by means of a special absorption apparatus, which is described and illustrated, are reported of the fluctuations of the iodine content of the air. These indicate that dew contains iodine, that the iodine content of the air increases with the evaporation of the dew, and that air near the ground is richer in iodine than air at some distance from the ground.

VI. *The relationship between the occurrence of goiter and the iodine content of the surroundings*, T. von Fellenberg (pp. 141–152).—A comparison is reported of the iodine content of food, air, soil, and water of four Swiss cantons in which the incidence of goiter was 1, 12.1, 56.2, and 61.6 per cent, respectively. In agreement with earlier observations of the author and with studies of McClendon, an inverse relationship was found to exist between the extent of goiter and the amount of available iodine. The differences in iodine content were evident in the air, drinking water, soil, milk, and eggs, but could not be detected in foods of plant origin. A further proof that the food of communities in which goiter was not prevalent was of high iodine content was the high iodine content of the urine of subjects in the canton in which goiter was least prevalent. This was even higher than the amount of iodine in iodized salt, and this is considered to be a strong argument in favor of the harmlessness of iodized salt.

VII. *The iodine content of rocks, geological formations, and minerals and the factors concerned in the iodine enrichment of the soil*, T. von Fellenberg (pp. 153–171).—This paper attempts to trace the origin of iodine in the soil through determinations of the iodine content of rocks, minerals, and soils representing various geological formations.

VIII. *Setting free of elementary iodine from the soil*, T. von Fellenberg, H. Geilinger, and K. Schweizer (pp. 172–184).—Evidence is presented that elementary iodine is set free from alkaline iodides present in soil and rocks by the action of inorganic catalyzers and is fixed in the presence of the oxygen of the air.

Rocks containing ferric oxide, as well as being rich in carbonates of the alkaline earths, give off iodine readily, while those containing iron in the ferrous form are less active. In the presence of small amounts of iron, the amount of iodine set free increases with an increased H-ion concentration. Fertilized soils give off less iodine than nonfertilized. The catalytic action of the soil is of significance for iodine accumulation. Soils with strong catalytic action take up less iodine than those with weak action.

IX. *Iodine elimination and iodine storage through the action of microorganisms*, T. von Fellenberg and H. Geilinger (pp. 185–190).—Experiments in vitro were conducted to determine whether iodine can be set free from inorganic compounds by the action of various bacteria and molds and such organisms as may be present in suspensions of feces. No iodine was given off in 13 days from a neutral iodide solution, but little from an alkaline solution, and much more from an acid solution. In the presence of bacteria or molds only a small amount of iodine was set free, or whatever was set free was taken up by the microorganism. The iodine enrichment of the soil is explained as follows:

The iodine which is present in the free state in the air is carried to the soil by the rain and there is partially adsorbed by the organic matter of the soil. From this mechanical adsorption it may be set free by the action of the inorganic catalyzers in the soil and then unites chemically with organic sub-

stances. Under other suitable conditions the organic iodine compounds through the action of microorganisms are changed into inorganic compounds, these processes being reversible. Plants have the power of taking up some of the iodine.

Animal and vegetable fats and oils, W. L. Austin and H. J. Zimmerman (*Washington: Bur. of the Census* [*U. S.*], *1924, pp. 27*).—The statistics given in this report cover the production, consumption, imports, and exports of animal and vegetable fats and oils, the raw materials used in producing the latter, and the stocks on hand in the United States by quarters for the calendar years 1919 to 1923. A previous report along similar lines has been noted (E. S. R., 47, p. 711).

Contribution to the knowledge of the colostral milk of cows [trans. title], H. Engel and H. Schlag (*Milchw. Forsch., 2* (*1924*), *No. 1–2, pp. 1–15*).—Milk samples from three cows differing in race, age, feed, and milk yield were obtained immediately after calving, at 6-hour intervals thereafter for 4 days, and at varying intervals up to the twelfth day. These were analyzed for acidity, specific gravity, refractive index, cryoscopy, and percentage of lactose, chlorine, total nitrogen, casein, albumin, and ash.

While the amount and composition of the colostrum differed with the individual cows, general changes in composition from the first to the final sample tested were noted as follows: The acidity of the colostrum was the highest, about 18°, at the first milking and then fell gradually, reaching normal values in from 6 to 12 days. The specific gravity of the first samples was very high (1.06 to 1.08) and the refraction very low, 31 or less. The lactose content of the first samples was very low (about 2 per cent) and gradually increased to normal. The chlorine content was variable but tended to be high in the first samples (0.148 to 0.163 per cent). The cryoscopic reading was variable, but highest in the first samples (58 to 60.5). The content of nitrogen-containing substances, especially water-soluble coagulable proteins, was very high throughout, even after 12 days. The total solids as a rule were very high, particularly in the first samples (25.1 to 33.6 per cent).

The fat content was exceedingly variable, but for the most part higher than normal, except as calculated on the dry basis, when it was low. The absolute ash content was also higher (1.01 to 1.37 per cent) than normal, but low when calculated on the dry basis. The content of inorganic substances such as P_2O_5, CaO, and MgO was exceedingly variable. The percentage of total ash was lower than in normal milk, indicating that the laxative action of colostrum is due to other constituents than ash. The colostral period in healthy cows, as judged by the analyses reported, lasts about 12 days, after which the milk is of normal composition.

The chemical and physical constants of colostral fat [trans. title], H. Engel, H. Schlag, and W. Mohr (*Milchw. Forsch., 2* (*1924*), *No. 1–2, pp. 47–56, figs. 7*).—Continuing the study of colostrum noted above, samples of colostral fat of the milk of six cows at varying intervals from immediately after calving to from 6 to 12 days were analyzed for melting point, solidification point, refraction, specific gravity, and saponification, iodine, Reichert-Meissl, and Polenske numbers. The data obtained are presented in tables and curves for each cow and in general averages.

The fat of the first sample differed most markedly from normal butterfat, with significantly higher values for melting point, solidification point, refraction, and iodine number, and lower for specific gravity, saponification number, Reichert-Meissl number, and Polenske number. Up to about 6 days the values showed marked irregularities, followed by a general return to normal. As in the above study, the milk of the different cows showed specific differences.

The average values for some of the constants are given as follows: Solidification point 30° C., melting point 44.5°, saponification number 210, iodine number 35, and Reichert-Meissl number 14. These values are intermediate between corresponding values for beef fat and normal milk fat. This is thought to indicate that colostral fat is really a mixture of body fat and milk fat, the proportion of the former gradually decreasing.

Synthetic organic compounds, S. P. SCHOTZ (*London: Ernest Benn, Ltd., 1925, pp. 412, figs. 110*).—Included in this reference book on the preparation, properties, and uses of various synthetic organic compounds are chapters on synthetic solvents, aromatic compounds, antiseptics and disinfectants, sweetening agents, intermediates for the manufacture of dyes, synthetic tannins, explosives, artificial silk, chemical warfare, and plastic masses, including celluloid and synthetic resins. The book is abundantly illustrated with photographs and diagrams.

The synthesis of some possible precursors of lysine, C. S. MARVEL, D. W. MACCORQUODALE, F. E. KENDALL, and W. A. LAZIER (*Jour. Amer. Chem. Soc., 46 (1924), No. 12, pp. 2838–2842*).—The methods employed in preparing the derivatives of caproic acid used in the investigation noted on page 261 are described briefly.

The isolation from autolyzed yeast of a crystalline substance melting at 223°, having the properties of a bios, W. H. EDDY, R. W. KERR, and R. R. WILLIAMS (*Jour. Amer. Chem. Soc., 46 (1924), No. 12, pp. 2846–2855, figs. 4*).—This is a complete report of the investigation noted from a preliminary report (E. S. R., 52, p. 110). In addition to descriptions of the method employed in isolating the product and the characteristic properties, evidence is presented as to its relation to Wildier's bios, to the antineuritic vitamin B, and to Bios I and II of Miller (E. S. R., 51, p. 561).

In minute doses (0.005 to 0.025 mg.) the material is said to have a similar effect upon the growth of yeast, both top and bottom. When fed in amounts of 0.116 mg. daily to rats on a vitamin B free diet, there is temporary but not lasting improvement. On substituting Seidell's picrate fraction (E. S. R., 51, p. 311) for the bios rapid growth results, thus showing that the bios is not identical with the antineuritic vitamin. In discussing the possible relation of bios to the two bioses of Miller, the authors state that "nothing in our method of isolation negates the possibility of more than one bios. In fact, the relative stimulation producible by the addition of our pure product and by the use of autolyzate lends strong probability to the suggestion that the latter contains more than one growth stimulant."

The effect of fermentation on the water-soluble vitamin content of wort, H. W. SOUTHGATE (*Biochem. Jour., 18 (1924), No. 6, pp. 1248–1251, figs. 2*).—To determine whether yeast does or does not synthesize vitamin B during its fermentation, equivalent amounts of wort, beer made from the same wort, yeast used in the fermentation of the wort, and the precipitate formed during sterilization of the wort by heating for 20 minutes at 125° C. were used as sources of vitamin B in feeding experiments with young rats.

The most rapid growth was secured with the wort, less rapid growth with the yeast, and no growth with the basal diet alone or with the addition of beer and the precipitate.

These results are thought to indicate that the yeast cell does not synthesize vitamin B during its growth in wort, but removes it almost quantitatively from the wort. A small fraction of the vitamin originally present in the wort is thought to have disappeared during the fermentation, thus accounting for the main loss of vitamin B in the preparation of beer, as noted in a previous paper (E. S. R., 52, p. 365).

The absorption of light by colored substances obtained in the orcinol reaction of pentoses [trans. title], G. SCHEFF (*Biochem. Ztschr., 147 (1924), No. 1-2, pp. 90-93*).—The extension coefficients are reported for amyl alcohol solutions of the colored substances formed in the Tollen orcinol reaction for pentoses.

The spectrophotometric determination of pentoses [trans. title], G. SCHEFF (*Biochem. Ztschr., 147 (1924), No. 1-2, pp. 94-102, fig. 1*).—The method involves the spectrophotometric reading of the extension coefficients noted above and the use of tables giving the corresponding concentrations of the pentoses.

The composition of ripe wine grapes from the Government viticultural station, Paarl, G. FRATER (*Union So. Africa Dept. Agr., Sci. Bul. 32 (1924), pp. 30*).—This publication contains tabulated analyses of 44 varieties of wine grapes grown in South Africa. The data include chemical analyses of juice, pulp, skins, stalks, and seeds, the percentage distribution of the bunch in pulp, skins, stalks, and seeds, and the physical dimensions of the bunch and berry. A list of 65 references to the literature is appended.

Methods of organic chemistry.—III, Special. IV, Special. Nitrogen-containing groups and organometallic compounds, edited by J. HOUBEN (*Die Methoden der Organischen Chemie. III, Spezieller Teil. IV, Spezieller Teil. Stickstoffhaltige Gruppen und Organometallverbindungen. Leipzig: Georg Thieme, 2 ed., rev. and enl., 1923, vol. 3, pp. XXXVIII+1117, figs. 35; 1924, vol. 4, pp. XXVIII+1046, figs. 26*).—These two volumes complete the second edition of Weyl's Die Methoden der Organischen Chemie (E. S. R., 49, p. 110).

A note on the solubilities of calcium soaps, G. A. HARRISON (*Biochem. Jour., 18 (1924), No. 6, pp. 1222, 1223*).—Tabulated data are presented on the solubility and melting points of pure calcium oleate, calcium palmitate, and calcium stearate.

All of these soaps were insoluble in absolute alcohol, ether, acetone, light petroleum, and water. Calcium oleate was soluble and the other two slightly or fairly soluble in chloroform, benzene, and xylene at the boiling point of these solvents. All were slightly soluble in acid alcohol (1 per cent HCl in absolute alcohol) at 0° C., fairly soluble at room temperature, and readily soluble at the boiling temperature. None had a definite melting point. The temperatures of conglutination were 115 to 120° for calcium oleate and stearate and 110° for calcium palmitate.

Note on the effect of ammonium sulphate and other salts on the colorimetric estimation of phosphorus, C. RIMINGTON (*Biochem. Jour., 18 (1924), No. 6, pp. 1297-1300, figs. 2*).—Attention is called to two sources of error which may lead to inaccurate results in the determination of phosphorus by the Briggs colorimetric method (E. S. R., 48, p. 111). One is the inhibiting effect of ammonium sulfate in high concentrations as would occur if used to remove proteins from the solutions to be examined. It was found that the diminution in the rate of color reaction in the presence of ammonium sulfate in excess was not due to the NH_4 or SO_4 ions as such, nor to an interference with the preliminary reaction between ammonium molybdate and the phosphate. When added to the solution after the development of the color, ammonium sulfate was without effect. It is concluded that the inhibition is upon the progress of the reaction rather than the result of a disturbance of the ionic equilibrium of the solution.

The other source of error is the presence of anticoagulants in excess. The limiting concentrations of various anticoagulants at which interference first occurs with the approximate concentration usually present are reported to

be, respectively, as follows: Sodium oxalate 0.008N and 0.002N, sodium citrate 0.008N and 0.003N, sodium sulfate 0.8N and 0.109N, and sodium fluoride 0.01N and 0.007N.

An apparatus for the graphic recording of oxygen consumption and carbon dioxide output, especially adapted for clinical work, H. C. HAGEDORN (*Biochem. Jour., 18 (1924), No. 6, pp. 1301–1307, figs. 3*).—The apparatus, which is illustrated by diagram and photograph, consists essentially of two symmetrical gas meters arranged to revolve on a common shaft in an ordinary water bath, and two spirometers of the type described by Krogh (E. S. R., 48, p. 859), recording on a common drum. One of the spirometer boxes is filled with moist soda lime to absorb carbon dioxide. This spirometer records the carbon dioxide output and the other the difference between the oxygen consumption and carbon dioxide output. The sum of the two readings thus measures the oxygen consumption. The accuracy of the results obtained is said to depend largely upon the care with which the spirometers are balanced, and for this purpose special bearings and adjustable counterbalances are provided.

A new method for the detection of raw and heated milk [trans. title], E. HEKMA (*Dept. Binnenland, Zaken en Landb. [Netherlands], Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta., No. 29 (1924), pp. 49–60; also in Verslag Ver. Exploit. Proefzuivelboerderij Hoorn, 1923, pp. 43–54*).—The test, which is a modification of the Frost test (E. S. R., 34, p. 113), is conducted as follows:

The milk is filtered through cotton, mixed with an equal volume of a 0.15 per cent solution of trypanblue in water or preferably in physiological salt solution, allowed to stand for 10 minutes, and then centrifuged for 20 minutes. The sediment is then examined as in the original method. If the milk is unheated the sediment consists of uncolored cells; if heated 10 minutes at 70° C., 2 to 3 minutes at from 80 to 90°, or 1 to 2 minutes at from 90 to 110°, of large, intensely colored cells; and if a mixture of heated and unheated milk, of colored cells mixed with colorless ones. The test is said to be applicable even if potassium dichromate or formalin has been added as a preservative.

A new method for the detection of raw and heated milk [trans. title], E. HEKMA (*Tijdschr. Vergelijk. Geneesk., 11 (1924), No. 1, pp. 11–32, pl. 1*).—Essentially noted above.

A method for the estimation of small quantities of copper in tissues, A. N. CURRIE (*Biochem. Jour., 18 (1924), No. 6, pp. 1224–1226*).—The method described is based upon the reaction between copper sulfate and copper arsenite to form copper hydrogen arsenite, "Scheele's Green."

The sodium arsenite solution is prepared by adding 0.1 cc. of anhydrous arsenic trichloride to 10 cc. of a 10 per cent solution of sodium hydroxide in a boiling tube, shaking, and repeating the process with a second portion of 0.1 cc. of arsenic trichloride, and finally diluting to 10 cc. As thus prepared, the reagent is said to be stable and sensitive to 1 in 135,000 parts of $CuSO_4$ in water. The upper limit of $CuSO_4$ with which accurate results are obtainable is given as 0.0050832 gm. in 10 cc. The technique for the determination, as applied to ox brain, is described in detail.

A simple clinical micromethod for the determination of sodium in blood serum [trans. title], F. LEBERMANN (*Biochem. Ztschr., 152 (1924), No. 3–4, pp. 345–354, figs. 2*).—The method described depends upon the precipitation of the sodium as acid sodium pyroantimonate and its determination by comparison of the turbidity of a suspension of the precipitate in alcohol-containing water with standards of known sodium content. It is said to be possible to determine with accuracy from 0.05 to 2 mg. of sodium by this

method, the results agreeing closely with those obtained by the longer Kramer-Tisdall gravimetric method employing the same reagent (E. S. R., 45, p. 716).

Estimation of uric acid by Benedict's method, H. COHEN (*Biochem. Jour., 18 (1924), No. 6, pp. 1327–1329*).—This paper calls attention to the necessity in the Benedict colorimetric method of determining uric acid (E. S. R., 47, p. 315) of deducting the color of the blank control. Mathematical calculations and experimental data are presented, showing that if this is done the method gives consistently accurate results over a wide range of concentration.

The pectin and pentosan content of cane juices, syrups, and molasses and its removal, R. G. W. FARNELL (*Internatl. Sugar Jour., 26 (1924), No. 309, pp. 480–486*).—In this continuation of the investigation of the pectic substances in sugar cane and its products (E. S. R., 51, p. 310), experiments are reported on the pectin and pentosan content of sugar cane juices, sirups, and molasses and on the removal of pectin and pentosans from solution.

The pectin determinations were made by the Haynes-Carré method, as noted in the previous study. The juices were boiled for two minutes, filtered by suction through a Buchner funnel to remove the heat-coagulable protein, and treated with a slight excess of NaOH before precipitation with N acetic acid and M calcium chloride. The sirups and molasses were treated in the same way except that the initial neutralization was omitted. The pentosans were precipitated by acetic acid-alcohol in the proportion of 20 cc. of N acetic acid to 270 cc. of 90 per cent alcohol.

Data calculated in percentage Brix are reported on the calcium pectate and pentosan content of 6 samples of juice, 1 of sirup, and 3 of defecation molasses. The calcium pectate varied from 0 in 3 samples of juice to 0.7 per cent in 1 sample of molasses, and the pentosan from 0.036 per cent in 1 sample of juice to 0.72 per cent in 1 sample of molasses, but no correlation was evident between the calcium pectate and pentosan figures.

In the second series of experiments a comparison was first made of the extent of precipitation of calcium pectate by the usual Haynes-Carré method, by a saturated solution of calcium hydroxide followed by acetic acid before boiling, and by an excess of calcium hydroxide in boiling solution without acidification. The last-named method resulted in the largest amount of precipitated calcium pectate.

Different portions of bamboo cane juice containing a known amount of pectin were treated with varying amounts of a suspension of calcium hydroxide of 4° Brix and also with saturated calcium hydroxide, and determinations were made of the calcium pectate precipitated. No precipitate was formed with 11 and 5 cc. of the 4° Brix solution for 800 cc. of juice, but with 16 cc. of saturated calcium hydroxide solution calcium pectate was precipitated to the extent of 0.09 per cent Brix. This confirms the previous observation that no calcium pectate is precipitated unless the solution has been rendered sufficiently alkaline to bring about the conversion of pectin to pectic acid.

To determine the effect of calcium hydroxide on the pentosan of cane juice, pentosan determinations were made on five samples of Trinidad seedling cane juice before and after the hot liming process. The data obtained indicate that pentosan is not removed in appreciable amounts in the lime precipitate by either cold or hot liming in acid or alkaline clarification.

Clarification in raw sugar factories, M. L. ROXAS and A. A. AFRICA (*Internatl. Sugar Jour., 26 (1924), No. 309, pp. 486–491*).—This paper reports preliminary results obtained in determining by the Deerr method (E. S. R., 44, p. 807) the proper reaction for liming in defecation in raw sugar manufacture. In the present series of experiments, the addition of limewater was extended considerably beyond the phenolphthalein neutral point.

On adding the lime to the cold juices in gradually increasing amounts, bringing the solutions to boiling, and allowing them to settle, two points of maximum clearness were obtained, one on the acid and the other on the alkaline side of neutrality. The pH values of these points varied with the juice, ranging between pH 5.22 and 6.5 on the acid, and pH 11 and 12 on the alkaline side.

It is concluded that for close control of liming in a factory in which the nature of the juice varies, the reaction should be determined for each tank of juice, and that for such control an automatic or semiautomatic apparatus should be devised to determine the reaction point, correlate this with the amount of lime to be added, and automatically add the lime.

Methods of chemical control for cane sugar factories (*Honolulu: Assoc. Hawaiian Sugar Technol., 1924, pp. 113, figs. 10*).—The subject matter of this volume, which constitutes the official methods of the Association of Hawaiian Sugar Technologists as adopted in October, 1923, has been revised from the 1916 edition of methods of the Hawaiian Chemists Association.

Scientific preservation of food, T. M. Rector (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1925, pp. XI+213*).—The principles involved in the preservation of foods by simple storage, refrigeration, dehydration, chemicals, fermentation, hermetic sealing, and sterilization are discussed in nontechnical language in this volume, written essentially for technologists in food industries.

Report of research laboratory, W. D. Bigelow (*Canning Trade, 48 (1925), No. 27, pp. 113–124; also in Canner, 60 (1925), No. 11, II, pp. 145–153*).—This progress report of the director of the research laboratory of the National Canners Association includes a brief statement of the work of the year in the various departments, supplemented by memoranda from members of the staff on bacteriological investigations, by J. R. Esty; heat penetration, by R. J. Thompson; springers and perforations, and vitamin investigations, by E. F. Kohman; corn black, and abnormal flavors in canned foods, by G. S. Bohart; miscellaneous researches and field work, by A. E. Stevenson; and work in California, by A. Richardson.

Perforation studies, E. F. Kohman (*Canning Trade, 48 (1925), No. 27, pp. 84–87, figs. 6; also in Canner, 60 (1925), No. 11, II, pp. 126–129, figs. 6*).—In this progress report another factor than oxygen (E. S. R., 51, p. 766) is shown to be responsible for some cases of perforation in tins. This is the natural coloring matter of the fruit, which acts as a depolarizer uniting with the film of hydrogen which ordinarily forms a protective coating on the surface of cans containing fruit acids. Data are presented showing that oxygen accelerates perforation in cans of Bing cherries, strawberries, and loganberries, but that the removal of oxygen does not prevent perforation.

Discoloration in canned beets, A. E. Stevenson (*Canning Trade, 48 (1925), No. 27, pp. 59, 60; also in Canner, 60 (1925), No. 11, II, p. 106*).—Three possible causes of discoloration in canned beets are mentioned, with suggestions for prevention.

Discoloration in the center of sliced beets is attributed to incomplete destruction of the oxidase, tyrosinase, present in the beet. A longer steaming process and greater promptness in canning are recommended to prevent this type of discoloration. A second type of discoloration is that occurring in incompletely filled cans in the portion of the beets projecting above the liquor. This is attributed to oxygen contained in the head space and is prevented by leaving practically no head space. A third type is that occurring in the entire contents of the can. This is accompanied by a change of reaction to the alkaline side which suggests that the discoloration may be due to bacterial

action. Processing at 240° F. is considered sufficient to prevent this type of discoloration. Attention is called to the importance of prompt and thorough cooling of the cans following the pressure process.

The processing of tomatoes: Results of 1924 experimental pack, J. R. Esty (*Canning Trade, 48 (1925), No. 27, pp. 51–54; also in Canner, 60 (1925), No. 11, II, pp. 94–96*).—A brief discussion is given of some of the points brought out in the investigation of 15,000 cans of tomatoes inoculated with tomato spoilage organisms and processed for different times under different conditions. While referring primarily to commercial canning, some of the findings are of equal application to home canning.

The chief cause of spoilage in canned tomatoes is considered to be the survival of a heat-resisting, nonspore-forming organism in insufficiently processed cans. If the raw tomatoes are bruised or are allowed to stand for a considerable period of time at a temperature higher than 75° F., the organisms, if present, will multiply rapidly. In canning, the addition of sugar appears to protect the organism and salt to assist in its destruction. The temperature and time necessary to sterilize the product depend upon the initial contamination, but in general the organisms are destroyed by a comparatively short process. The method of packing also affects the time required for sterilization. Pressure cooking is thought to offer no advantage over the water bath.

The jellifying capacity of fruit juices and pectin solutions [trans. title], G. Wendelmuth (*Kolloidchem. Beihefte, 19 (1924), No. 4–6, pp. 115–137, figs. 6; abs. in Fruit Prod. Jour. and Amer. Vinegar Indus., 4 (1924), No. 4, pp. 7, 8*).—In this study of the factors influencing the jellying of fruit juices and pectin solutions, the viscosimeter was used to measure the jellifying power.

As has been noted by previous workers, the several factors contributing to jellification were found to be the sugar content, the amount of pectin, and the degree of acidity of the juice. It is emphasized from the point of view of practical jelly manufacture that prolonged storage of fruit juice results in the decomposition of the pectin into pectic acid and methyl alcohol, with loss of jellifying properties. The same change takes place in the preparation of pectin if the pectin is redissolved and reprecipitated in the process of purification. The phenomenon of jellying of fruit juices is explained as being due chiefly to the change of water of solution to water of hydrolyzation in the presence of sugar. Hydrolyzed pectin and hydrolyzed sugar are then formed, the pectin acting as a frame work to hold the sugar in an emulsion-like colloidal condition. It is pointed out that just as good jellies are obtainable by cold processing with stirring as by cooking, but that excessive stirring in the cold or excessive cooking destroys the emulsion-like structure.

Dehydrated spinach: Manufacture, handling, and storage, P. F. Nichols and R. Powers (*Amer. Food Jour., 20 (1925), No. 1, pp. 37–39*).—This is a general discussion of methods of dehydrating spinach on a commercial scale, together with a report of a study of the effect of storage on dehydrated spinach. This study showed that to insure satisfactory keeping qualities the moisture content of the spinach should not exceed 5 per cent. With a moisture content of 9.5 per cent the product is said to be barely salable at the end of one year.

The distillation of wood, G. Dupont (*Distillation du Bois. Paris: Gauthier-Villars & Co., 1924, pp. XV+234, pl. 1, figs. 53*).—This reference book for engineers and chemists deals with the chemistry of wood, the chemical reactions utilized in its distillation, and the chemical composition of the products obtained. Descriptions, with diagrams, are included of modern apparatus used in the wood distillation industry.

Bleaching of wood pulp, I, II, C. E. Curran and P. K. Baird (*[Tech. Assoc. Pulp and Paper Indus.], Tech. Assoc. Papers, Ser. VII, No. 1 (1924), pp. 63–68,*

fig. 1).—This contribution from the U. S. Forest Products Laboratory at Madison, Wis., consists of two papers as follows:

I. *Factors affecting the process and their control.*—Various factors involved in bleaching wood pulp are listed with the more important effects of these factors, precautions that must be observed for the control of variables in the bleaching process are discussed, a description of the apparatus and experimental procedure used in bleaching studies is given, and the methods of analysis used in studying the progress of bleaching are outlined.

II. *Effect of hardness of water.*—This reports a study of the effect of hardness of water upon the bleaching of pulp. Four waters were used, a hard artesian well water, a medium hard lake water, the same lake water softened by Permutite, and distilled water. Three series of experiments were conducted with all of these samples, but no difference in the rate of bleaching, color, and yield of bleached pulp as affected by the kind of water could be noted.

METEOROLOGY

Monthly Weather Review, [**January–February, 1925**] (*U. S. Mo. Weather Rev., 53 (1925), Nos. 1, pp. 47, pls. 11, figs. 11; 2, pp. 49–98, pls. 14, figs. 10*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for January and February, 1925, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 1.—The Place and Origin and Recurvature of Typhoons (illus.), by C. Chu; Pressure over the Northeastern Pacific and the Weather in the United States, December, 1924, and January, 1925 (illus.), and Hawaiian Rainfall (illus.) both by A. J. Henry (see p. 211); Some Outstanding Aerological Problems, by W. R. Gregg; Average Free-air Winds at Lansing, Mich. (illus.), by C. L. Ray; Records of Total Solar Radiation Intensity and Their Relation to Daylight Intensity—a Correction, by H. H. Kimball; Notes on Changes in Some of the Weather Elements during the Solar Eclipse of January, 24, 1925 (illus.), by B. M. Varney; Observations on the Solar Eclipse of January 24, 1925, at Washington, D. C., by H. H. Kimball; Special Aerological Observations during the Solar Eclipse of January 24, 1925, by L. T. Samuels; Meteorological Conditions on Baker and Howland Islands, by W. G. Ramsay; and A 55-year Record of Railfall in Bermuda, by W. H. Potter.

No. 2.—Coronas and Iridescent Clouds, by C. F. Brooks; Using Weather Forecasts for Predicting Forest-fire Danger (illus.), by H. T. Gisborne (see p. 211); The Forest-fire Season at Different Elevations in Idaho (illus.), by J. A. Larsen (see p. 211); A Preliminary Study of Effective Rainfall (illus.), by J. F. Voorhees (see below); A Rain-gage of Standard Commercial Materials and Parts (illus.), by B. C. Kadel; The Criteria of a Cold Winter, by A. J. Henry; A Remarkable Two-theodolite Pilot-balloon Series (illus.), by W. C. Haines; Fruit-spray and Harvest-weather Forecast Work of the Weather Bureau in New York State, by E. B. Calvert (E. S. R., 53, p. 112); and The Climate of Trinidad, B. W. I. (illus.), by P. E. James.

A preliminary study of effective rainfall, J. F. Voorhees (*U. S. Mo. Weather Rev., 53 (1925), No. 2, pp. 63–65, fig. 1*).—This is an attempt to determine by means of "a comparison of total rainfall with run-off, supplemented by some data on leaching from the University of Tennessee Experiment Station and some data on evaporation from trees, obtained by the author," how much of the water suply is available for the use of plants, with some general conclusions applicable to the region of Knoxville, Tenn. "It appears that the

possible effective rainfall for this region will average from 6 to 8 in. per year, which is enough to double the present average yield."

Using weather forecasts for predicting forest-fire danger, H. T. Gisborne (*U. S. Mo. Weather Rev., 53 (1925), No. 2, pp. 58–60, fig. 1*).—Studies at the Priest River Experiment Station in northern Idaho indicate that it is possible "to predict the degree of dryness of forest-fire fuels with a very satisfactory percentage of dependability. Three features stand out as desirable: First, the official weather forecasts should be strictly adhered to, and local weather conditions should not be given too much weight; second, the period covered by the fire-danger forecast should be lengthened as much as possible; third, predictions of rain or no rain will be more valuable if given with more assurance."

The forest-fire season at different elevations in Idaho, J. A. Larsen (*U. S. Mo. Weather Rev., 53 (1925), No. 2, pp. 60–63, fig. 1*).—From examinations of variations in temperature and precipitation at different elevations in northern Idaho, the author concludes that "comparisons of air temperature and precipitation data obtained in the various forest zonations in northern Idaho, made for the purpose of gaging the length and intensity of the fire season in the various altitudinal belts, show a possible fire season of 150 days for the lower western yellow pine forest, 107 to 132 days for the forests of western white pine, and about 76 days for subalpine forests at elevations of 7,500 ft. During these days the mean air temperature averages above 50° F. This length of fire season occurs only during summers of subnormal rainfall. When rainfall is normal the season is cut down to 139 days in western yellow pine forests and 67 days in the western white pine forests. Records for the subalpine forests are altogether too meager to permit determination of the length of the normal fire season as limited by rainfall.

"As criteria indicating the probable intensity of a fire season, the mean air temperature, maximum air temperature, and amount of precipitation during July and August, as well as the relative humidity, appear to be much more critical in the lower western yellow pine forests than on the forests which appear at higher elevations. Wind movement is greatest in the subalpine forests and lowest in the western white pine type, and were it not for the low temperature and high humidity occurring at the higher elevations the fire hazard would be much greater in the subalpine type than is actually the case."

Climatological data for the United States by sections, [1924] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 11 (1924), No. 13, pp. [232], pls. 23, figs. 8*).—This number summaries the climatological data for each month of 1924 and for the year as a whole for each State.

Climatological data for the United States by sections [January–February, 1925] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 12 (1925), Nos. 1, pp. [193], pls. 4, fig. 1; 2, pp. [193], pls. 5, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1925.

Weather conditions, E. B. Ferris (*Mississippi Sta. Bul. 225 (1924), pp. 3, 4*).—A table is given which shows the maximum, minimum, and mean temperatures and precipitation for each month from March to November, inclusive, 1923 and 1924, at the South Mississippi Substation at Poplarville.

The season of 1923 was very wet, that of 1924 very dry and hot.

Hawaiian rainfall, A. J. Henry (*U. S. Mo. Weather Rev., 53 (1925), No. 1, pp. 10–14, figs. 4*).—This is a brief review of the available data and a description of the more important characteristics of Hawaiian rainfall.

"The outstanding feature of the rainfall distribution in Hawaii is the very wide variation from one place to another separated from each other by only

a few miles, also by the wide variation in the amounts for the same months in different years. As much as 31.95 in. of rain have been registered as falling on a single day and 102.46 in. in a single month of 31 days, or an average of 3.3 in. on each day of the month. The annual amounts range from a maximum of 562 to a minimum of 2.46 in. on the island of Maui." The mean annual rainfall varies from 61.74 in. on Oahu to 106.69 in. on Hawaii, the mean for the group being 83.84 in. For the group as a whole, the chief maximum occurs in December and the chief minimum in October. "This minimum is most pronounced on Kaui and Oahu and on the leeward slopes of Maui, Molokai, and in a much less degree in the Kau district of Hawaii."

In general the primary cause of rainfall is the pressure distribution over the north Pacific that controls the direction and force of the winds. The northeast trade winds are the immediate cause. The rainfall is almost wholly orographic. There is some indication of periodicity in the rainfall.

SOILS—FERTILIZERS

The data of geochemistry, F. W. Clarke (*U. S. Geol. Survey Bul. 770 (1924), pp. 841*).—This is the fifth edition of this work (E. S. R., 43, p. 419), containing a large amount of information, some of which may be of value in the study of soils and soil fertility.

The size distribution of particles in soils and the experimental methods of obtaining them, S. Odén (*Soil Sci., 19 (1925), No. 1, pp. 1–35, figs. 21*).—In a contribution from the Royal Institute of Technology, Stockholm, a review is presented of methods of mechanical soil analysis, with particular reference to the size distribution of particles in soils.

Analyses of soils of Burke County, L. M. Carter, M. W. Lowry, W. O. Collins, R. M. Soule, and G. L. Fuller (*Ga. Agr. Col. Bul. 302 (1924), pp. 40, pl. 1, figs. 4*).—Supplementing the physical analyses of the soils of the county made in cooperation with the U. S. D. A. Bureau of Soils (E. S. R., 42, p. 322), analyses of samples of the prevailing soil types are presented and discussed, with particular reference to their fertility requirements and crop adaptations.

The results showed that the prominent agricultural soil types are uniformly deficient in nitrogen, it apparently being the limiting fertility constituent. There is also a need for an increased supply of phosphoric acid. While the potash content is greater than that of either the nitrogen or phosphoric acid, these soils are extremely deficient in available potash.

Soil survey of Grundy County, Iowa, E. M. Jones and W. E. Carson (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1039–1061, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 320,640 acres lying a little northeast of the center of Iowa. The surface consists of gently rolling prairie interspersed with broad, level areas and prominent knolls. Drainage is well established.

The soils are of glacial and loessial origin and are mainly dark colored silt loams with some silty clay loams and sandy loams. Including meadow, 12 soil types of 10 series are mapped, of which the Tama, Carrington, and Wabash silt loams cover 46.8, 23.8, and 12.1 per cent of the area, respectively.

Soil survey of Boone County, Nebraska, F. A. Hayes et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1169–1220, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 442,880 acres in northeastern Nebraska, the greater part of which lies in the Loess Hills region. The surface ranges from

almost flat to hilly, the greater part being rolling. The greater part of the county is well drained.

The soils have the characteristics of true prairie soils. Including dune sand, 22 soil types of 11 series are mapped, of which the Marshall silt loam covers 62.3 per cent of the area.

The field study of Scottish soils, M. M. Monie (*Scot. Jour. Agr., 6 (1923), No. 1, pp. 48–54, pls. 4, fig. 1*).—Continuing work previously reported by the West of Scotland Agricultural College, a description is given of bowlder clay and the chief soil-forming rocks and the subsoils and soils to which they give rise. In addition data are presented on the bowlder clay characteristics of each rock group and on the classification of Scottish soils in provinces, groups, and types.

Preliminary profile studies of certain forest soils, P. S. Spokes (*Soil Sci., 19 (1925), No. 1, pp. 45–55, figs. 6*).—Studies conducted at Oxford University are reported, the purpose of which was to ascertain whether the quality of timber is influenced to any extent by soil reaction as indicated in a study of soil profiles. The reaction was determined by the lime requirement method and by the determination of the pH values.

There appeared to be a definite correlation between the loss on ignition and the lime requirements in the soils studied down to a depth of 40 cm. (15.7 in.). Rapid decomposition of the soil covering was accompanied by little fluctuation in the acidity of the soil horizons, whereas slow decomposition was always associated with marked variation in the soil reaction.

The quality of larch was found to be lowered where slow decomposition of the soil covering and variation in soil reaction occurred. Scots pine appeared to be little influenced as regards quality by such fluctuations in acidity.

Genesis and evolution of the soils of the Ukraine [trans. title], G. Makhiv (*Vist. Silsk. Gosp. Nauk.* (*Jour. Agron. Sci.* [*Ukraine*]), *3 (1924), No. 3–4, pp. 6–22, pl. 1*).—The results of a survey of these soils are briefly presented.

Loess and fossil soils of the southwest Ukraine [trans. title], V. Krokos (*Vist. Silsk. Gosp. Nauk.* (*Jour. Agron. Sci.* [*Ukraine*]), *3 (1924), No. 3–4, pp. 22–31*).—A brief description is given of these soils.

Drainage investigations at Aberdeen, J. Hendrick (*Scot. Jour. Agr., 7 (1924), No. 1, pp. 8–18*).—Lysimeter experiments with slightly acid soil are reported which showed that immense amounts of ammonia can be added to this soil in the form of ammonium sulfate with or without other fertilizers, and without any material amount of ammonia being lost in the drainage. Nitrification was found to take place readily and rapidly in this soil, and all of the ammonia added could be recovered in the drainage in the form of nitrate. The lime requirement therefore did not in any way check nitrification.

It was further found that soluble phosphoric acid in the form of superphosphate, even when added at the rate of several tons per acre, was completely fixed by the soil, and no more phosphoric acid appeared in the drainage than in the case of an unfertilized soil. There is considered to be no danger of loss of phosphoric acid in this manner, no matter how freely soluble phosphates are applied.

Potash was less completely retained by the soil than either phosphate or ammonia. At the same time, when used in practical quantities, only very small amounts were lost in the drainage. Sulfates and chlorides as well as nitrates were found to be freely washed away in the drainage.

Bases were washed away along with the acids, and the drainage was practically neutral. The chief bases found in the drainage water were lime, mag-

nesia, and soda, with comparatively small quantities of potash. Lime was found in the greatest amount and magnesia and soda in somewhat similar quantities. The amount of these bases removed in the drainage was greatly increased by fertilizing with ammonium sulfate, superphosphate, and potassium chloride, which also increased the amount of sulfuric, nitric, and hydrochloric acids found in the drainage.

These results are taken to indicate that even when such soluble fertilizers are used in far greater amounts than is ever likely in practice, there is no danger that the soil will be not able to supply sufficient bases for all practical requirements over a long period of years.

Soil mulching or cultivating experiments, G. L. Sutton (*Jour. Dept. Agr. West. Aust., 2. ser., 1 (1924), No. 3, pp. 333–337, figs. 5*).—Experiments in western Australia to determine how far and under what conditions the cultivation of winter-fallowed land is profitable during the spring and summer are briefly reported. These showed that the general practice should be to cultivate the fallowed land in the spring and again prior to seeding, and that in cases where the ground is weedy this cultivation should be supplemented by additional cultivation during the summer.

Trials of sub-soiling, 1924 (*Jour. Min. Agr.* [*Gt. Brit.*], *31* (*1925*), *No. 10, pp. 925–930*).—A progress report of studies previously noted (E. S. R., 52, p. 118), and now transferred from the Ministry of Agriculture to the Institute of Agricultural Engineering at Oxford University, is presented. The investigations are now planned to determine the number of years during which the beneficial effects of subsoiling will last and the reasons which cause the increased fertility.

The results of the second year of experiments at Essex showed that each subsoiled plat again produced an increased yield over the plats in the same field which were plowed only. On brick earth, barley responded in approximately the same measure as did the crop of oats grown the previous year. Wheat following potatoes on bowlder clay showed a substantially lower percentage of increase, but was nevertheless about equal in yield to that of a crop of wheat grown on London clay the previous year. Barley following potatoes on sand and gravel showed a general increase in yield. It was found that the disturbed subsoil was not consolidated.

An outline is given of the experimental fields at Oxford. Tares and oats were substantially increased during the first year by subsoiling to depths of 5 and 7 in., the shallower depth giving the better results.

The availability of subsoil potash, S. B. Haskell (*Soil Sci., 19* (*1925*), *No. 2, pp. 105–114*).—Studies conducted at the Massachusetts Experiment Station are reported which showed that, on the basis of culture tests, subsoils from fine sandy loam when treated with plant nutrients other than potash showed no rawness or failure to respond to treatment. The potash in these subsoils was apparently sufficiently available to give maximum production. The potash in the deeper subsoil was either more rapidly available or was present in greater quantity than in the more shallow subsoils. The data are also taken to indicate that the amount of potash in a plant at harvest time may not bear any definite relation to the amount actually required by the plant.

The decomposition of salicylic aldehyde by soil organisms, W. A. Gardner (*Science, 60* (*1924*), *No. 1561, p. 503*).—A very brief account of experiments conducted at the Alabama Experiment Station is presented which indicated that none of 27 pairs of cultures of soil organisms were able to decompose salicylic aldehyde except to a very limited extent. In such cases it is thought that the bacteria used organic matter contained in the soils instead of salicylic aldehyde as the source of carbon.

Studies on the action of gases which originate from the decomposition of Astragalus sinicus in rice fields on the growth of the rice plant [trans. title], I. ONODERA (*Ber. Ōhara Inst. Landw. Forsch., 2 (1923), No. 3, pp. 361–381, pls. 9, fig. 1*).—Studies are reported which showed that the injurious action of the green manure crop *A. sinicus* on the nutrition of rice plants is due to the gases which are formed as the result of the decomposition of the green manure. These gases were found to consist mainly of methane and carbon dioxide, which retarded the growth of rice plants. They also had an indirect injurious influence on plant growth in that they caused a deficiency of oxygen in the rice field.

How can the injurious action on the growth of rice plants of the gases originating from the decomposition of Astragalus sinicus be prevented? [trans. title] I. ONODERA (*Ber. Ōhara Inst. Landw. Forsch., 2 (1923), No. 3, pp. 383–396, fig. 1*).—Experiments are reported which showed that the growth of rice plants in soils receiving *A. sinicus* as green manure was increased by the addition of lime salts. Calcium oxide when given in large quantities gave the best results. The treatment of such soils with hydrogen peroxide was also quite effective in this respect. Lime salts improved conditions in pot experiments, but potassium permanganate had an opposite effect. Calcium superphosphate gave the best results on loam soils and calcium oxide on clay soils. Very good results from such treatments were obtained when the field was drained and dried after the third cultivation. Even better results were obtained when a large amount of calcium oxide was used with other fertilizers, or when a large amount of calcium superphosphate was given after the third cultivation and the soil was drained.

Decomposition of certain organic toxins by vanillin decomposing organisms, W. A. GARDNER (*Science, 60 (1924), No. 1556, p. 390*).—Studies conducted at the Alabama Experiment Station are briefly reported, the results of which indicated that soil organisms capable of decomposing vanillin are not able to decompose resorcinol, coumarin, quinoline, benzidine, and caffeine.

Soil microbiology in 1924: An attempt at an analysis and a synthesis, S. A. WAKSMAN (*Soil Sci., 19 (1925), No. 3, pp. 201–249, figs. 2*).—In a contribution from the New Jersey Experiment Stations a summary is presented of work reported or in progress during 1924 on soil microbiology. This indicates that the interest in soil microbiology is prevalent throughout the world, but that the progress made is not yet sufficient for a scientific understanding of soil processes and for practical agriculture.

A quantitative and qualitative determination of the bacterial flora of some representative virgin and cultivated Texas soils, O. B. WILLIAMS (*Soil Sci., 19 (1925), No. 3, pp. 163–168*).—Studies conducted at the University of Texas are reported which showed that there is unlikely to be any qualitative difference in the flora of virgin and of cultivated soils. Types frequently encountered were found to occur in both soils, and too few representatives of the types less frequently encountered were isolated to warrant any conclusion. With one exception the virgin soil showed more bacteria per gram of soil than did the cultivated soil. The failure to isolate *Bacillus subtilis* was noteworthy, and is taken to indicate that *B. subtilis* is less common in this section than in other sections where qualitative examinations of soil have been made. Strictly aerobic bacteria seemed to be less common in these soils than the facultative forms. No gas-producing forms were isolated, which was contrary from what was expected.

The fixation of nitrogen by Azotobacter in a displaced solution and in soil residue therefrom, C. B. LIPMAN and L. J. H. TEAKLE (*Soil Sci., 19

(1925), No. 2, pp. 99–103).—Studies conducted at the University of California, in which the efficiency of *A. chroococcum* at nitrogen fixation in a displaced soil solution was determined without the addition of carbohydrate except that in 1 cc. of inoculum from a mannite culture, are reported.

Such efficiency was found to far exceed that obtained in rich sugar or alcohol media. The efficiency of nitrogen fixation by Azotobacter in soil, the solution of which had been displaced, was much greater than that in solutions rich in sugars or alcohols. The efficiency was greater in this case with Azotobacter in pure cultures than in previously unsterilized soil. These results are taken to indicate the possibility that the inoculation of soils with Azotobacter may be developed.

The fertilizer nutrients required by barley, wheat, and oats, as shown by both soil and water cultures, R. L. Jones and F. R. Pember (*Soil Sci., 19 (1925), No. 3, pp. 169–199, figs. 3*).—Studies conducted at the Rhode Island Experiment Station are reported which showed that the differences in the amounts of nitrogen and potash required by these three cereals when grown in the different media were small, and that the conditions necessary for the absorption of these fertilizer nutrients were not different. The difference in the amounts of phosphoric acid required for the optimum growth of the cereals in both soil and water cultures was the principal point of dissimilarity. While the reason for the greater phosphoric acid requirement of the pot-grown cereals was not evident, it was found that the greater absorption of this nutrient by these plants was not due to the fact that it was utilized within the plants as a protective agent against aluminum or iron toxicity. The straw-grain ratio was found to be greater in the plants from the water culture series than in those from the soil culture series.

The fertility of Washington soils, F. J. Sievers and H. F. Holtz (*Washington Col. Sta. Bul. 189 (1924), pp. 45, figs. 13*).—An analytical discussion is presented of data obtained from fertility studies of the different important soil types of the State.

These have indicated that eastern Washington soils are well supplied with phosphorus, potassium, and lime, but are deficient in nitrogen and organic matter. The poor seasonal distribution of precipitation in the Palouse country causes the available nitrogen to be inadequate for continuous cropping to cereals, even though the total precipitation and total nitrogen content of the soil are adequate. Continuous cropping is profitable only where a legume, an intertilled crop, or a nitrogen fertilizer is substituted for the summer fallow, thus to supply the available nitrogen. Nitrogen fertilizers have no place in the agriculture of the Palouse country if legumes are grown as a summer fallow substitute in accordance with recommendations. If nitrogen fertilizers are used, they should be applied in the late winter or early spring to avoid leaching losses and at the same time to provide for the moisture necessary for their distribution. The successful development of legumes may require the application of gypsum, but results have been so irregular that its use is recommended only after field trials.

In the Big Bend and Horse Heaven countries, moisture is so decidedly the determining factor in crop production that no plant nutrient problems exist. In the irrigated sections the nitrogen and organic matter deficiencies are easily overcome by growing legumes. It is only under those irrigated conditions where the soils are extremely coarse and gravelly or where all soil products are sold directly and no manure is returned that mineral plant nutrient deficiencies exist or may develop.

Western Washington soils, due to the leaching resulting from heavy precipitation, are deficient in the mineral plant nutrients and are generally acid in reaction. The soils in the northern portion of western Washington are glacial and those in the south residual in nature, and the same type is in all cases more fertile when of the former origin. Most of the diked lands are deficient in phosphorus only and will respond to treatment with such fertilizers. Salt water diked lands of recent formation, and therefore deficient in organic matter, generally present a deficiency of nitrogen and, because of poor physical condition, are difficult to reclaim without the use of manure or green manuring crops. The river valley lands are decidedly acid in reaction but do not respond to liming, although phosphorus fertilizers universally produce increased yields on all crops. The upland silt loam soils are low in organic matter and mainly deficient in phosphorus. A complete fertilizer, preferably barnyard manure, supplemented with phosphorus, will give best results and should be used until legumes are well established. The sands and sandy loams are deficient in all plant nutrients and therefore give best results from a complete fertilizer, barnyard manure being preferred. Where legumes are to be grown lime must also be applied. The gravelly loams, besides being deficient in all plant nutrients, including lime, are exceedingly low in their water-holding capacity. Complete fertilization and liming need to be supplemented with irrigation water before they can be farmed successfully. The marsh soils are well supplied with organic matter and nitrogen but deficient in phosphorus and potassium. Their high nitrogen content makes it unnecessary to grow legumes, and therefore, although strongly acid, liming is not recommended. The arid soils in western Washington, besides being limited in their nitrogen content, are deficient in phosphorous.

Lime has given good results when used on the sands and sandy loams and the irrigated gravelly loams in western Washington and on the impervious irrigated soils in eastern Washington.

The maintenance of soil fertility (*Ohio Sta. Bul. 381 (1924), pp. 244–354, figs. 6*).—This bulletin reports the results of these experiments, conducted under the supervision of C. E. Thorne, up until 1923 (E. S. R., 42, p. 516.)

The results show that, while it has been possible to maintain fair average yields under continuous cropping by the liberal use of manure or of chemical fertilizers approaching manure in composition, the crops grown in rotation have given larger yields with a much lower expenditure for manure or fertilizers.

Experiments in the use of lime and limestone, conducted in 10 counties of the State, indicate that, for the soils overlying sandstones or noncalcareous shales and for the soils over limestone of the more ancient glaciation in southwestern Ohio, the systematic addition of lime-bearing materials has become indispensable to the attainment of the most profitable crop yields, but that over the more recently glaciated limestones the response to liming is likely to be relatively small.

With but one exception—the bed of ancient Lake Maumee in Paulding County, the newest land in Ohio in both geologic and agricultural history—every soil and every crop under test has responded profitably to phosphorus, the most effective carrier of which is acid phosphate, with basic slag and steamed bone meal following closely. Raw phosphate rock has caused material increases in yield, but the effect of acid phosphate is so much greater as to render the use of raw phosphate relatively unprofitable.

On the Miami soils potassium chloride, when added to acid phosphate in relatively small quantities, has given a profitable increase of crop. On the

soils overlying sandstones the effect of potassium has been irregular, seeming to be partly dependent upon the addition of lime as well as of phosphorus. It has practically never been profitable to use potassium in the absence of phosphorus.

Nitrogen in sodium nitrate, when used on cereal crops grown in rotation with clover, has failed to repay its cost in 6 of the 14 counties in which these experiments are located, and the margin of profit has been relatively small in all cases. The results strongly indicate that for Ohio conditions the nitrogen supply for such crops should be secured through their systematic rotation with leguminous crops and the careful saving of manure. Of the carriers of nitrogen employed including sodium nitrate, ammonium sulfate, linseed oil meal, dried blood, and tankage, sodium nitrate has been the most effective. Ammonium sulfate has been second on land supplied with lime, but on acid soil it aggravates the unfavorable conditions.

Apparently, farm manure has not given results comparable to those given by commercial fertilizers, and attention is especially drawn to the necessity of reinforcing it with phosphorus to meet the requirements of Ohio soils and cropping conditions.

The influence of manure and irrigation water on the carbon, phosphorus, calcium, and magnesium of the soil, C. T. Hirst and J. E. Greaves (*Soil Sci., 19 (1925), No. 2, pp. 87–97*).—Studies conducted at the Utah Experiment Station are reported which showed that the application of manure to a highly calcareous soil tended to widen the carbon-nitrogen ratio, whereas irrigation water narrowed it. The phosphorus applied to the soil was found distributed in the first, second, and third foot sections, with the greater quantity of it in the first foot section. This is taken to indicate that the irrigation water caused a concentration of the phosphorus in the surface foot sections, which might be otherwise if excessive quantities of water were used. The loss of calcium oxide from the soil was increased by manure, but decreased as the amount of irrigation water applied increased. Magnesium carbonate was removed from the soil more rapidly than calcium carbonate, and it was rendered more soluble by the organic manure. The percentage distribution within the 3 ft. was not greatly changed either by manure or irrigation water, but the calcium-magnesium ratio was widened by both.

Results of fertilizer experiments with cotton and Irish potatoes on some of the principal soil types of North Carolina, W. F. Pate and J. J. Skinner (*N. C. Dept. Agr. Bul., 1924, Sept., pp. 69, figs. 14*).—The results of experiments conducted in cooperation with the U. S. Department of Agriculture on some of the principal soil types of North Carolina to determine the best ratio of phosphoric acid, nitrogen, and potash for cotton and potato production are reported in some detail.

Fertilizer tests with and without ground limestone, W. S. Blair (*Sci. Agr., 5 (1925), No. 6, pp. 199–201*).—Experiments begun at the Dominion Experimental Station, Kentville, N. S., in 1914 are reported, the purpose of which was to determine the most profitable source of nitrogen and phosphorus for local soils and crops. A 3-year rotation of potatoes, grain, and clover and timothy hay was followed on sandy loam soil.

Slightly better results were obtained with sodium nitrate than with ammonium sulfate per unit of nitrogen applied. The natural flora indicated an increased acidity on unlimed soil receiving ammonium sulfate. The returns with slag were slightly better than with acid phosphate, especially where no lime was used. Limestone was apparently the most beneficial to the hay crops, particularly clover, although wheat responded to a marked degree. Oats

were grown successfully on decidedly acid soil. It was found inadvisable to apply limestone to a potato crop.

On the effect of calcium oxide and calcium carbonate upon the decomposition of soy-bean cake and herring cake in two different soils, K. Miyake and K. Nakamura (*Jour. Biochem., 3 (1923), No. 1, pp. 27–54*).—Studies conducted at the Hokkaido Imperial University, Sapporo, Japan, on the effect of calcium oxide and calcium carbonate on the decomposition, ammonification, and nitrification of soy bean and herring cakes in loam and acid soils are reported.

The results showed that both calcium oxide and calcium carbonate stimulate the decomposition, ammonification, and nitrification of organic matter in soil. The effect of lime upon the decomposition of the carbon content of organic matter or upon the ammonification of organic matter was found to vary according to the kind of soil, but not according to the nature of the organic matter. On the other hand, the effect of lime upon nitrification was the same for both kinds of soil, but varied with the nature of the organic matter.

Calcium oxide favored the formation of carbonate in the soil, while calcium carbonate stimulated the production of carbon dioxide gas. Calcium oxide had a greater effect upon the decomposition of carbon than calcium carbonate, but the effect of calcium oxide upon ammonification and nitrification was the smaller.

The decomposition of twice as much organic carbon from either soy bean or herring cake was required in acid soil as in loam soil to produce the same amount of ammonia nitrogen. The decomposition of one and one-half times as much organic carbon from herring cake as that from soy bean cake was necessary to produce the same amount of ammonia nitrogen in either loam or acid soil.

Field experiments on the availability of nitrogenous fertilizers, 1918–1922, J. G. Lipman, A. W. Blair, and A. L. Prince (*Soil Sci., 19 (1925), No. 1, pp. 57–79, figs. 4*).—A report is presented of the third 5-year period of the nitrogen availability field experiments at the New Jersey Experiment Stations (E. S. R., 31, p. 124; 43, p. 627).

The results as a whole are considered to emphasize strongly the difficulty in maintaining the nitrogen supply of the soil when nonlegume crops only are grown. The percentages of applied nitrogen recovered in the crop under field conditions were generally small, and the losses of nitrogen from soils under constant cultivation were therefore great. The imperative need of lime in connection with fertilizers that are physiologically acid was emphasized. However, there was a marked effect of lime in depleting the nitrogen supply of the soil when no legume crops were grown. It was found that clover may be grown with ease if the conditions are made favorable by the use of lime, phosphate, and potash.

The rôle of calcium in Dunkirk and Volusia soils, J. A. Pepin (*Sci. Agr., 5 (1925), No. 5, pp. 139–154, figs. 3*).—Studies are reported which showed that liming increases plant growth in the Dunkirk clay loam and the Volusia silt loam soils.

It is concluded that the repeated handling of the soil is probably responsible for the lesser response of the Dunkirk clay loam soil, owing to an increase of nitrification and general bacterial activity resulting from the increased aeration. It is also considered probable that the drying of the soil, induced by excessive handling, has an effect on the soil colloids very similar to that of liming. The Dunkirk clay loam seemed unable to supply properly the needs of plants such as alfalfa having a high calcium requirement.

Liming markedly increased the accumulation of nitrates in the Volusia silt loam as well as in the Dunkirk clay loam, and this is thought to account for part of the beneficial effect of the treatment. The Volusia soils did not contain enough calcium to meet the needs of a normal plant growth, and one case was also deficient in phosphorus. Liming seemed to decrease the availability of the phosphorus in both the Volusia and Dunkirk soils. It increased the solubility of potassium in the Dunkirk soil but not in the Volusia soil. The amount of calcium in the water extracts of both soils was nearly doubled by liming, as determined six months after the treatment.

An extensive bibliography is included.

Commercial fertilizers (*Md. Univ. Quart., No. 111 (1925), pp. 27*).—This publication contains guaranties and actual analyses of 417 samples of fertilizers and fertilizer materials collected for inspection in Maryland during the period from July 1, 1924, to January 1, 1925.

Analyses of fertilizers, season 1923–1924; analyses of cotton-seed meal, W. G. Haywood et al. (*N. C. Dept. Agr. Bul., 1924, Dec., pp. 74*).—The first part of this bulletin contains guaranties and the results of actual analyses of over 1,500 samples of fertilizers and fertilizer materials collected for inspection in North Carolina during the season 1923–24. Part two contains analyses of 81 samples of cottonseed meal.

Testing fertilizers for Missouri farmers, 1924, L. D. Haigh (*Missouri Sta. Bul. 230 (1925), pp. 57, fig. 1*).—Guaranties and actual analyses of 431 samples of fertilizers and fertilizer materials, representing 138 registered brands and collected for inspection in Missouri during 1924, are presented and discussed.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1924, C. S. Cathcart (*New Jersey Stas. Bul. 409 (1924), pp. 5–35*).—This bulletin contains guaranties and actual analyses of those samples of fertilizers and fertilizer materials collected for inspection in New Jersey during 1924 which were not reported in Bulletin 405 (E. S. R., 53, p. 22). Similar data are reported on 42 samples of ground bone and 19 samples of lime and limestone. A list of brands of fertilizers and fertilizer materials registered for sale in the State during 1924 is also included, together with a discussion of the inspection for the entire year.

Fertilizer registrations for 1925, C. S. Cathcart (*New Jersey Stas. Bul. 413 (1925), pp. 5–24*).—A list of brands of fertilizers and fertilizer materials registered for sale in New Jersey for 1925 is presented.

Fertilizer industry, A. W. G. Wilson (In *Development of Chemical, Metallurgical, and Allied Industries in Canada. Ottawa: Canada Dept. Mines, 1924, pp. 153–161*.—Data are summarized on the principal sources of nitrogenous, phosphatic, and potassic fertilizers in Canada.

AGRICULTURAL BOTANY

The cell wall and the external medium, J. H. Priestley (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 495*).—"Evidence is supplied that the cell wall differentiates from a complex plasma surface into an inner lamella—namely, cellulose and pectin—and an outer (the middle) lamella of pectic and fatty acids. These acids form gelatinous soluble salts with Na, K, and Mg, but insoluble flocculent salts with Ca. Hansteen-Cranner has shown that one result is the disintegration of the differentiated tissue behind the root apex when placed in dilute solutions containing only a salt of either Na, K, or Mg, owing to the solution of the middle lamella; the tissue, on the other hand, remains coherent in the solution of a Ca salt.

"It can be shown experimentally that the relative proportion of these bases in the soil materially affects the migration of fatty substances along the walls. As a consequence the presence and extent of fat deposition in such layers as endodermis and exodermis may be materially modified by the bases in the soil, while plants forming unusually large quantities of fatty acids, such as the plants characteristic of peat habitats, may be disorganized when grown on soils containing more Ca as the result of the choking of the tissue immediately behind the meristem through the accumulation of insoluble Ca soaps. From this standpoint the important 'basic ratio' in the soil is the proportion of Na+K+Mg to Ca."

The nutrition of the potato plant with special reference to water cultures, W. NEWTON (*Jour. Amer. Soc. Agron., 15 (1923), No. 10, pp. 392–399, fig. 1*).—A preliminary experiment showed that large differences in the soil moisture supply may greatly alter the character of potato plants. The marked differences induced by varying the moisture supply led to an attempt to devise a satisfactory water culture technique in order to avoid the uncertainties and difficulties incident to soil and sand cultures.

The general behavior of the plants in the series covered with felt mats during the first two weeks suggested that a successful technique of growing tubers in water cultures depends largely upon an early development of satisfactory root systems. A germinator was constructed consisting of a large jar with a raised perforated false bottom on which the tuber seed pieces were placed, and the jar was filled with water to a point 2 in. below the false bottom. The sides were lined and the top covered with thick felt which was kept saturated with water. Such a germinator showed marked advantage over other methods, as young plants could be selected that were comparatively uniform so far as sprout and root development were concerned.

From a physiological standpoint, the effect of atmospheric humidity upon the development of roots and sprout appeared to warrant further study. The time of sprouting is affected by the relative humidity of the atmosphere, but not to the same degree as root development. Apparently growth is closely associated with turgor. Roots, having less protective tissue than sprouts to prevent transpiration, are more affected by the atmospheric humidity.

In order to gain some knowledge of the requirements of the potato for certain ions, cultures were grown omitting essential ions. The 10 cultures in which the sulfate as well as the potassium ion were omitted were similar in most respects to the potassium-free cultures. The most significant depression in the yield of tubers and of dry matter, as compared with the complete solution cultures, was obtained in the 10 cultures from which the phosphate ion was omitted. In the case of these cultures, abnormalities did not appear until the latter part of the growing period, the first evidence of injury becoming apparent in the dying of the tips.

Particular attention is called to the rapid root disintegration and death in the calcium-free cultures, which occurred in spite of leaving a 25-gm. seed piece attached to the seedling. It appears that the potato plant can not store up a calcium reserve, and that some potato plants have difficulty in securing an adequate calcium supply from many solutions. The opposite appears true in the case of potassium. The normally high potassium and low calcium content of potato tubers and the greater solubilities of potassium salts compared with calcium support the experimental results. It is supposed that what might almost be called the beneficial effects of omitting potassium may be due to the creation of more favorable conditions for the absorption of calcium. Potato

plants when grown in soil and then transferred to complete and to potassium-free solutions always made greater new top growth when transferred to the latter. In view of these results, the question may be raised whether the beneficial effects generally obtained by using potassium fertilizers on potatoes may not be due, at least in part, to the indirect effect of increasing the calcium content of the soil solution.

The response of plants in soil and water-culture to aeration of the roots, R. C. KNIGHT (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 495*).—"Maize grown in aerated soil cultures produced a greater weight of dry matter than control plants in nonaerated soil. The concentration of CO_2 in the soil atmosphere was markedly higher in the nonaerated series than in the controls. If normal aeration of the soil was prevented by covering the soil with a seal, the concentration of CO_2 rose as high as 15 per cent. In soil in trial pots without plants the CO_2 concentration rose as high as 34 per cent in 23 days. Maize and white mustard did not respond to aeration in water culture, but aerated water cultures of wallflower and *Chenopodium album* showed an increase in dry weight over controls."

Observations on the effect of carbon-dioxide accumulation on root elongation, C. HUNTER and E. M. RICH (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 487*).—The authors here report as to variations of carbon dioxide concentration affecting the rate of root elongation, plants (*Vicia faba* and *Impatiens balsamina*) showing different degrees of sensitiveness to this factor, modifications of the rate of root elongation due to the addition of carbon dioxide or the removal of accumulations of this gas as detected by direct measurement, the occurrence and duration of minute fluctuations during root elongation as affected by this treatment, and the addition of carbon dioxide disturbing the equilibrium of the condition of the root as indicated by changes in its electrical resistance.

The effect of electric currents on the growth of plants in pot cultures, V. H. BLACKMAN and A. T. LEGG (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 487*).—"Pot-culture experiments carried out during a period of six years with wheat, barley, and maize show that these plants exhibit increases of dry weight when subjected to electric currents as low as 0.1×10^{-10} ampere per plant. A percentage increase in dry weight of 27 ± 5.7 was shown by maize plants grown under glass for little more than a month. Currents of the order of 1×10^{-8} ampere per plant and higher were found to be injurious. With barley plants subjected to the discharge for various periods the greatest effect was obtained from electrification during the second month of growth, when an increase of 118 per cent in grain and 39 per cent in dry weight was obtained."

Photo-electric changes in green and white leaves, J. C. WALLER (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 488*).—"Variegated geranium leaves show electrical changes in response to light similar to those of green geranium leaves partly shielded by dark paper, the chlorotic portions of the former corresponding to the shielded portions of the latter. Green petals of hydrangea act similarly to green geranium leaves, while white petals give little response. This is further evidence that the photo-electric change is specially associated with the chlorophyll function.

"The ratio between intensity of light and electrical response is as might be expected from other physiological ratios.

"A leaf tested after being kept under normal conditions of sunlight is different from the same leaf after many hours in the dark."

The interrelation of light and temperature in growth and assimilation, F. G. GREGORY (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 486*).—Data

here noted include growth of leaf area and increase of dry weight in the greenhouse, the method of studying growth in leaf area and the errors of the method, growth of leaf area during summer and winter, and the compound-interest law of leaf growth and its modifications when light intensity is comparatively low; growth under continuous illumination at different constant temperatures, the effect of temperature on the growth of single leaves and of the total leaf surface, the effect on the net assimilation rate, total assimilation as dependent primarily on leaf-surface growth, growth at supra-optimal temperatures, the law of the optimum and the law of limiting factors, and growth and assimilation as conditioned by light intensity and temperature under all conditions; and the energy efficiency of plants, variation of efficiency with temperature, and the hypothesis of shifting optima and the law of limiting factors.

The direct effect of light on the rate of water-loss from the mesophyll of the leaf, F. Y. Henderson (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 487*).—"The evidence for and against the control of transpiration by stomata is reviewed. The question of the direct action of the mesophyll cells in such control is discussed, and experimental work—using Darwin's 'slitting' method, in which the stomata are rendered nonoperative—is brought forward."

The extraction of sap from living leaves by means of compressed air, H. H. Dixon and N. G. Ball (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 486*).—Branches of *Tilia americana* and *Sambucus nigra* were inclosed in a strong cylinder so that their cut ends protruded. Air at pressures up to 20 atmospheres was admitted into the cylinder, and the liquid which exuded from the cut end of the branch was collected. This liquid was found to be completely, or almost completely, free from sugars. Experiments in early and late summer gave similar results. After the leaf cells had been made permeable by means of toluene vapor the sugar in the expressed sap amounted to about 5 per cent.

Influence of vegetable pulp on chemical conditions in media and upon the coordination of work of biochemical catalyzers [trans. title], J. Effront (*Compt. Rend. Soc. Biol.* [*Paris*], *88 (1923), No. 2, pp. 132–135*).—Vegetable pulps lend themselves particularly well to the study of absorption. Such pulps, when freed by heat and washing from extractives, and dried at 100° C., furnish powders which form in water compact gels which absorb alkali, acid, and enzyme and facilitate the study of conditions, operations, and direct and reciprocal influences in connection with biochemical catalyzers. Details are given regarding a few of these.

Absorption of alkali, organic acid, and enzyme by vegetable pulps [trans. title], J. Effront (*Compt. Rend. Soc. Biol.* [*Paris*], *88 (1923), No. 2, pp. 129–132*).—Absorption by plant pulps of acid, alkali, and enzyme is shown in tabular form.

The minimum temperature of germination of seeds, F. A. Coffman (*Jour. Amer. Soc. Agron., 15 (1923), No. 7, pp. 257–270*).—Experiments were undertaken in a preliminary way in 1917, and more comprehensively in 1920, to find the minimum temperatures at which seeds of different common crop plants would germinate, the minimum temperatures at which satisfactory germination percentages might be expected and the variations between such temperatures in different crops, and whether lower temperatures than those commonly used in seed testing laboratories would be beneficial in the germination of seeds. Two types of germination chambers were used.

The work as reported shows that seeds of different species germinate at different temperatures. Within a species, starchy seeds are exceeded by oily

seeds as regards safety under exposure to low temperatures. All of the smaller grains can germinate at the temperature of melting ice, the decreasing order of germination strength under freezing conditions being barley, rye, wheat, and oats. Sorghums increase in resistance to cold through the softer, more starchy types to such harder seeded types as Freed. Alfalfa and clover seed germinate more readily at low temperatures than do the other commonly grown crops. From the results obtained it appears that in general it would be better to use lower temperatures for the germination of alfalfa, the clovers, and the cereals than those employed in seed testing laboratories. This appears to be especially true of alfalfa and clover seed.

A method in micro-technique, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 4, p. 11*).—Since in the preparation of many kinds of pathological plant tissue for microscopical study the significant bacteria or spores are often lost in the process, the author here presents a method by which it is said to be possible to retain bacteria and spores of various fungi in position. The method consists in covering the glass surface with a very thin layer of agar made up at the rate of 15 or 20 gm. per 1,000 cc. of water. It has been found satisfactory with Colletotrichum, Gloeosporium, the rusts, and many other fungi, less so with *Septoria*, and inadequate with *Cercospora*.

The resistance of bacteriophages to the action of certain chemical substances [trans. title], R. Bruynoghe and P. Brutsaert (*Compt. Rend. Soc. Biol.* [*Paris*], *88 (1923), No. 12, pp. 966–968*).—Tests show that different bacteriophages resist unequally the action of some substances utilized. Bacteriophages from different sources acting on organisms of the same sort may present very marked differences as regards resistance to chemical substances.

Some physiological aspects of soil toxicity, B. E. Livingston (*Jour. Amer. Soc. Agron., 15 (1923), No. 8, pp. 313–323*).—A brief account of the history of opinion and research as to soil toxicity, of soil toxicity as an environmental condition, and of soil toxins, their origin, and their control, points out in conclusion that probably most toxic soils may be benefited by increased freedom of subterranean drainage and increased aeration, combined in some instances with the addition of substances such as lime to form harmless new compounds or to render the plants more resistant.

Influence of plane of nutrition on susceptibility to injury from toxic concentrations, F. W. Morse (*Jour. Amer. Soc. Agron., 15 (1923), No. 7, pp. 297–300*).—A review of experimentation showing somewhat conflicting results leads to the conclusion that while some cases indicate that the plane of nutrition is influential, other cases show toxicity to be independent thereof. When well-known practices are being followed, the development of unhealthy conditions in the crop is likely to be due to faults in the plane of nutrition, and the irregularity must be sought and measured by consideration of the different conditions of plant growth.

Methods of diagnosing toxicity, P. L. Gile (*Jour. Amer. Soc. Agron., 15 (1923), No. 8, pp. 305–312*).—A critical review is presented of contributions made in recent years by various workers on the cause, nature, and estimation of soil toxicity or ineffectiveness and factors related thereto in connection with plant growth.

Studies in the physiology of the fungi.—XVII, The growth of certain wood-destroying fungi in relation to the H-ion concentration of the media, F. S. Wolpert (*Ann. Missouri Bot. Gard., 11 (1924), No. 1, pp. 43–97, figs. 18*).—In continuance of this series (E. S. R., 53, p. 122), the author has studied the growth reactions of *Daedalea confragosa*, *Armillaria mellea*, *Pho-*

Polystictus versicolor, and *Lenzites sepiaria* toward different initial active acidity of synthetic, peptone-nutrient, and cellulose-nutrient media at different temperatures, determining for each species the limits of pH, optimum pH zone, optimum temperature, and changes in the active acidity of the solution due to growth. In addition the utilization by these fungi of strips of filter paper and of celluloses from white oak, pine, sugar maple, and poplar woods has been studied.

Among the detailed conclusions drawn, it may be stated that in general the range of pH in which these fungi will grow, and the amount of mycelial growth, depend upon the individual organism, the composition of the nutrient solution, the initial active acidity, and the temperature. The major portion of the growth curves of all of these fungi is on the acid side of neutrality and in the majority of cases wholly so. In the peptone-nutrient solution the fungi grow throughout a wider pH range, have a wider optimum pH zone, and produce more felt than on the Richards solution. With the exception of a slight lowering of the initial acidity by *Polyporus adustus* in the more acid solutions, *the mycelial growth of all of these fungi increases the acidity of the* Richards solution.

All the species grow in a medium with peptone as the only source of both nitrogen and carbon, growth being fully as good as in the Richards solution where carbon is supplied in the form of cane sugar and nitrogen as ammonium nitrate. None of the species grow as well in a solution with cellulose as the carbon source as with sugar and peptone as carbon sources. Of the three types of liquid media the peptone-nutrient solution with sugar is by far the best. These fungi apparently make better use of organic forms of nitrogen than they do of the inorganic forms.

It is thought that under other environmental and physiological conditions the results would vary somewhat from those here presented. The pH limits, optimum pH zone, and direction of change in the active acidity of the substratum vary with the environmental conditions.

Some statistics of evolution and geographical distribution in plants and animals, and their significance, J. C. Willis and G. U. Yule (*Nature [London], 109 (1922), No. 2728, pp. 177–179, figs. 4*).—"In a paper read at the Linnean Society under the above title on February 2, the statistical methods long employed in 'Age and Area' were pushed to their final conclusion." This and related work are reviewed in the present notes, as also in contributions previously noted (E. S. R., 51, p. 821; 52, p. 219).

Botanical pen-portraits, J. W. Moll and H. H. Janssonius (*The Hague: Martinus Nijhoff, 1923, pp. VIII+472, figs. 111*).—The primary object of this book is to give somewhat elaborate descriptions of the microscopic characters of a certain number of vegetable drugs, representing as far as possible all parts of plants used in pharmacy, but several descriptions containing the macroscopic characters have been added. The arrangement of the articles is alphabetical, but drugs showing the same organographical character have been placed together as much as possible. A complete alphabetical list of the papers cited in the several articles is included, and a glossary and an index are appended.

GENETICS

General evolution, together with the criticism of Darwinism and of Lamarckism, B. Dürken (*Allgemeine Abstammungslehre Zugleich eine Gemeinverständliche Kritik des Darwinismus und des Lamarckismus. Berlin: Borntraeger Bros., 1924, 2. ed., pp. 205, figs. 38*).—This book deals with the

critical analysis of Darwinism and of Lamarckism as a means of explaining the evolution of life.

Heredity, E. Guyénot (*L'Hérédité. Paris: Libr. Octave Doin, 1924, pp. X+463, figs. 47*).—The present understanding of the laws and mechanism of heredity is described.

Two decades of genetic progress, E. M. East (*Smithsn. Inst. Ann. Rpt., 1922, pp. 285–295*).—A reprint of the article previously noted (E. S. R., 48, p. 661).

Material for demonstrations of accessory chromosomes, R. L. King (*Science, 60 (1924), No. 1555, pp. 362, 363, figs. 2*).—The demonstration of the sex chromosomes in the spermatogonial cells of the testicles and the follicular cells of the ovary of *Orchelimum concinnum* and *O. vulgare* is suggested for class use, since the sex chromosomes are so distinct from the autosomes in these species.

Frequency of mutations for chlorophyll-deficient seedlings in maize, H. K. Hayes and H. E. Brewbaker (*Jour. Heredity, 15 (1924), No. 12, pp. 497–502, figs. 2*).—The frequency of the appearance of chlorophyll deficiencies was observed in first-year self-fertilized lines of 6 varieties of corn commonly grown in Minnesota. The percentages of first-year self-fertilized lines which segregated for chlorophyll deficiencies ranged from 39.4 per cent in Minnesota No. 13 to 7 per cent in Northwestern Dent. The large percentage of segregating lines in Minnesota No. 13 is held to indicate that recent mutations for chlorophyll deficiencies have occurred. Four probable mutations for seedling chlorophyll deficiencies have appeared among 953 selfed lines of corn obtained from 7 varieties and the progeny of one cross.

Distinction between primary and secondary chromosomal mutants in Datura, A. F. Blakeslee (*Natl. Acad. Sci. Proc., 10 (1924), No. 3, pp. 109–116*).—Among the studies carried on during a term of years with Datura (E. S. R., 46, p. 27; 47, pp. 221, 822; 49, p. 567), some have shown that certain recurrent mutants in *D. stramonium* are due to the presence of a single extra chromosome in one of the 12 sets. In several of these ($2n+1$) types, the evidence is considered as conclusive that the extra chromosome is a specific one which brings about the peculiarities in the mutant by means of the unbalance which its factors produce over the normal $2n$ condition. Since there are in all only 12 chromosomal sets, not over 12 mutants of the ($2n+1$) type would be expected, each corresponding to the presence of a different extra chromosome. For some time, however, more than 12 such mutants have been known, and at present there are over 20 which have been under cultivation for at least two generations. The occurrence of so large a number of mutants coming under the same chromosomal formula has naturally constituted the main Datura problem for some time. Evidence, however, accumulating from different sources indicates that these 25-chromosome mutants are not all unrelated types; that, on the contrary, they may be arranged in not over 12 groups consisting of a single mutant or of a primary mutant and one or more secondary mutants. The present paper gives brief evidence for the grouping of ($2n+1$) mutants, evidence as to which are primary and which secondary mutants, and evidence as to the cause of the difference between the two.

In seeking a basis for the difference between the primaries and secondaries, it has been shown that the difference is not due to a Mendelian factor, that in one case the secondary is modified apparently by deficiency of a portion of the extra chromosome, and that the cytological findings described in the paper noted below give a chromosomal basis for the facts observed, being confirmed by the occurrence of complementary secondaries.

The configurations and sizes of the chromosomes in the trivalents of 25-chromosome Daturas, J. Belling and A. F. Blakeslee (*Natl. Acad. Sci. Proc., 10 (1924), No. 3, pp. 116–120, figs. 2*).—"The primary 25-chromosome forms arise from the normal chromosome distribution in triploids, pollinated by diploids or selfed; or from nondisjunction in diploids, or in other primaries. This nondisjunction results in about ⅓ per cent of 13-chromosome pollen (and possibly egg cells). The primary forms have trivalents in which the open *V* predominates. The odd chromosome when detached is mostly straight. The secondary 25-chromosome plants come occasionally from corresponding primaries (including triploids), and also from diploids and other primaries. Their method of formation possibly consists in a change in the chromosome concerned, so that its two ends are homologous. Among the trivalents of the secondaries, the closed *V*-ring is usually predominant. The odd chromosome detached from the trivalent is often rolled into a small ring. The working hypothesis of an occasional reversed crossing-over, or interchange of nonhomologous segments between two chromosomes of a trivalent, is being used until a better hypothesis is found."

The reduction division in haploid, diploid, triploid, and tetraploid Daturas, J. Belling and A. F. Blakeslee (*Natl. Acad. Sci. Proc., 9 (1923), No. 4, pp. 106–111, figs. 3*).—If it be true that the number and the nature of the chromosomes, which the zygotic cell of a flowering plant has received from the sperm nucleus and the egg cell, will account for most of the inherited qualities of the resulting plant, then the brief period during which the parental contributions to the gametes are being distributed (this period comprising the first division in the mother cells of the pollen) is very important in the life history of such a plant. The present account outlines a study of this period, chiefly in Datura.

It is stated that the homologous chromosomes, at the late prophase and the metaphase of the first division in the pollen mother cells of diploid, triploid, and tetraploid Daturas, are connected by their ends. No chromosomes are connected in the haploid Datura. There are, as usual, 12 pairs of connected chromosomes in the diploid plant, the connection occurring usually at both ends. The triploid plant shows 12 trivalents, usually two chromosomes being connected at both ends, and one laterally attached, with one free end. In the tetraploid plant there are 12 quadrivalents; the usual arrangement being two pairs, the component chromosomes of which are joined at both ends, the pairs being connected with each other at one or both junctions. Under ordinary conditions nondisjunction is rare in the diploid but regular in the tetraploid plant, occurring in more than one-quarter of the pollen mother cells. At normal temperatures nonreduction is rare in the diploid, triploid, and tetraploid, but apparently regular in haploid plants. In this way pollen grains having the somatic numbers of chromosomes are produced. The volume of the cytoplasm in the mother cells at the reduction division is closely proportional to the number of haploid groups of chromosomes present in the cell.

Inheritance in tetraploid Daturas, A. F. Blakeslee, J. Belling, and M. E. Farnham (*Bot. Gaz., 76 (1923), No. 4, pp. 329–373*).—In the papers previously noted (E. S. R., 41, p. 634; 44, p. 327; 47, pp. 524, 822), the occurrence of tetraploid plants in *Datura stramonium* has been announced, with brief discussion of their peculiarities. The present paper gives in some detail the evidence for tetraploidy in this species, consisting of peculiarities in the ratios obtained in the inheritance of simple Mendelian characters, and in the arrangement of the chromosomes which is associated with these ratios. The work of others is summarized.

Tetraploid (4*n*) plants, as compared with diploid (2*n*) plants of *D. stramonium*, are characterized by spherical instead of ovate capsules and by larger pollen grains, showing only slightly more shriveled grains than do diploids. The chromosomes in the pollen mother cells are typically arranged in 12 sets of 4 each, assorting in some 70 per cent of the cases 24–24, in about 30 per cent 23–25, and in rare cases 22–26.

Tetraploids have occurred spontaneously at least 6 times, 3 of them in 3 distinct lines and 3 of them as plants derived from crosses between 2 other lines. Tetraploids, whether selfed or crossed, set fewer capsules, containing a relatively small number of seeds, than do diploids.

"Crosses between tetraploids and diploids apparently are impossible when the diploid is the female; when the tetraploid is the female, an average of one viable seed has been obtained from about four pollinations. The offspring from this cross have been diploids, triploids, and ($2n+1$) mutants. . . .

"Tabulations of breeding data in some 37,400 individuals for tetrasomic inheritance of the Mendelian pair purple-white flower color confirm the theoretical ratios, and justify the assumption of random assortment of the chromosomes which carry the genes for purple pigmentation.

"The inheritance of the pair armed-*inermis* is in accord with the inheritance of the purple-white pair, aside from the production of about 2 per cent exceptional recessive offspring from A_3a parents when back-crossed to a_4 individuals. A possible explanation is suggested, but no experimental evidence on the question is as yet available.

"The possible relation of tetraploidy to the evolution of plants is discussed, and breeding and cytological tests are given to distinguish tetraploidy from 'double diploidy.' Union of homologous chromosomes is suggested as a possible cause of *gigas*-like forms without the double number of chromosomes."

Crosses with Siamese cats, K. Tjebbes (*Jour. Genetics, 14 (1924), No. 3, pp. 355–366, pl. 1*).—The inheritance of hair color and length and of eye pigmentation has been investigated in 56 cats produced by crossing a Siamese male with a white blue-eyed deaf Persian female and a Siamese female with a dark tabby male.

In coat color, the presence of a chromogen factor *A* is assumed, which in Siamese cats is replaced by a recessive allelomorph a_1 which causes a reduction of the intensity of pigment when a factor *B* for chocolate black pigment is present. A dominant factor *D* carried by the Persian whites suppresses all pigment. A factor *C*, representing a series of allelomorphs, produces the tabby pattern. *C* was also carried by the white Persians. A new type of striped Siamese was produced in the F_2 of the Siamese × tabby cross. Long hair was recessive to short hair. The eye colors were not so clear in their mode of inheritance. The production of differences in the color of the two eyes of the same individuals, offspring of the white Persian female parent, was an important finding. Both coat and eye pigmentations were assumed to be modified by quantitative physiological processes.

Colour inheritance in sheep.—I, Black colour and badger-face pattern in Welsh mountain sheep, J. A. F. Roberts (*Jour. Genetics, 14 (1924), No. 3, pp. 367–374, pls. 2*).—The results are reported of a study conducted at the University College of North Wales dealing with the inheritance of the badger-face pattern (black on muzzle, poll, underline, and legs), black, and white in Welsh mountain sheep. The original flock used in the experiments consisted of 77 badger-face ewes and 1 ram of each of the three types. The colors of the lambs produced with the number of each kind from each of the crosses mentioned are tabulated below:

Summary of results of experimental breeding with Welsh mountain sheep

Cross	Number of lambs		
	Badger-face	Black	White
Badger-face ram × badger-face ewes	12		
Badger-face ram × white ewes	2		16
White ram × badger-face ewes	6		1
Black ram × white ewes		23	
White ram × black ewes		5	2
Badger-face ram × black ewes	1	3	
Black ram × badger-face ewes		12	1

It is concluded that the badger-face pattern is recessive, while black is dominant to white. Black seemed to be dominant to the badger-face pattern, though exceptions occurred in these results and in the relation of black to white.

The inheritance of certain chlorophyll characters in maize, G. N. Stroman (*Genetics, 9 (1924), No. 6, pp. 493–512, figs. 5*).—In this contribution from the Texas Experiment Station, chlorophyll-deficient characters differing markedly from any described previously and which are, more or less, the reverse of the virescent type, are described with their method of inheritance.

The expression of a seedling chlorophyll character, yellow-white, which is the reverse of virescent, is shown to be the result of either or both m_1 and m_2 factors. These factors seem to be linked with from 30 to 40 per cent of crossing-over. A chlorophyll character termed "white-base-leaf" and shown to be due to the presence of a recessive factor, w_1, may be observed at any time from the seedling stage until the plant is fully mature. Its full expression appears when the plant is nearly mature. Seedling zebra, another seedling chlorophyll character, is expressed as a result of two recessive factors, zb_1 and w_1. Where an *m* factor and an albino factor w_2 are both heterozygous within the same progeny, 9:3:4 ratios are obtained, indicating that the w_2 factor inhibits all chlorophyll development even in the presence of m_1 or m_2. According to certain data presented w_1 seems to occur in the same linkage group as the factor for sugary endosperm *su*, and m_1 in the Y (factor for yellow endosperm) linkage group.

Maternal inheritance of chlorophyll in maize, E. G. Anderson (*Bot. Gaz., 76 (1923), No. 4, pp. 411–418, figs. 2*).—A pale green striping, which appeared sporadically in a culture of maize free from chlorophyll abnormalities, is transmitted maternally only. Striped plants, when self- or cross-pollinated, give green, striped, and pale seedlings in various proportions. The distribution of the different types is not random with respect to position on the ear. Green plants give only green progeny. Pale green seedlings die. Striped seedlings repeat the performance of the parent.

Artificial self-pollination of red clover, L. E. Kirk (*Sci. Agr., 5 (1925), No. 6, pp. 179–189, figs. 6*).—Artificial self-pollination of red clover begun in Minnesota and carried forward in Saskatchewan gave results supplementing and agreeing with the findings of Fergus (E. S. R., 49, p. 131). Compared with natural cross-pollination, the percentage of seed set by artificial self-pollination was 4.25 for Minnesota red clover and 10.2 for Altaswede. As seen in the field, the families of red clover from self-fertilized seed were characterized by lack of size and vigor and by reduced variability in contrast with plants from open-pollinated seed. The occurrence of numerous chlorophyll-

deficient seedlings and other abnormalities seemed to indicate that strains of red clover may be freed from undesirable recessive characters by self-fertilization.

The inheritance of acquired characteristics, P. Kammerer, trans. by A. P. Maerker-Braden (*New York: Boni & Liveright, 1924, pp. 414, pls. 18, figs. 11*).—This book sets forth the author's arguments in favor of the inheritance of acquired characters, based on the results of many experiments with the lower animals and observations on others. A large portion of the book deals with the progress of the human race.

FIELD CROPS

Improvement of field crops, V. Lathouwers (*Manuel de l'Amélioration des Plantes de la Grande Culture. Gembloux: Jules Duculot, 1924, pp. 240, figs. 47*).—This manual outlines the several methods of plant breeding, and discusses in detail the general technique in the breeding of field crops. Special attention is accorded the breeding of wheat, spelt, barley, oats, rye, corn, sugar beets, fodder beets, potatoes, clover, and grasses. The plant breeding activities of the Agronomic Institute at Gembloux are reviewed.

Spacing experiments, S. C. Harland (*Trop. Agr.* [*Trinidad*], *2* (*1925*), *No. 3, p. 67*).—A method used in preliminary experiments with cowpeas and possibly applicable to other crops consists in spacing the plants along the row in a series of gradually diminishing distances. Thus, the first two plants in the row may be 2 ft. 6 in. apart, the second and third 2 ft. 5.5 in., the third and fourth 2 ft. 5 in. apart and so on, until the plants become very close, say 2 to 3 in. While the distance between the rows will be uniform in successive experiments, it might also be varied. To insure a smooth curve the mean yield of at least 50 plants at each spacing point should be determined.

[**Experiments with field crops in Georgia, 1924**] (*Georgia Sta. Rpt. 1924, pp. 64–66, 67, 68–79, 85, figs. 8*).—Varieties of wheat, oats, barley, rye, corn, cotton, and sweet potatoes outstanding in comparative trials are listed as heretofore (E. S. R., 51, p. 132), with notes on the winter resistance of the cereals and comment on the results of triangular fertilizer experiments with wheat, cotton, and corn.

The leading cotton varieties included Deltatype Webber, Salsbury, Acala, and strains of Express, Cleveland, and Delfos. Application of paper mulch (E. S. R., 44, p. 437) on ground between cotton rows after the first cultivation, without further culture, seemed to result in an increase of 764 lbs. of cotton. Seed delinted with sulfuric acid produced larger plants and more seed cotton per acre than untreated seed. The best spacing results were obtained from 16- and 8-in. distances with yields of 870 and 860 lbs., respectively. With 300 lbs. of 8-3-3 fertilizer the 8-in. spacing produced the most cotton, while with 800 lbs. the 16-in. did best. At planting appeared to be the best time to apply nitrogen to cotton. Sodium nitrate and ammonium sulfate produced about as much cotton as organic forms of nitrogen and the difference in cost made them preferable. The most profitable acre rate of application of sodium nitrate was 166 lbs. Acid phosphate continued to give better results than various forms of rock phosphate, which differed little in effectiveness.

A chemical study of the potash and phosphorus requirements of cotton gave indications that a definite variation exists in the couples of elements present in the plant, traceable to differences in fertilizer treatment. Thus the magnesium-calcium ratio has been found to vary under different treatments from 4.62 to 3.09. Ground rock phosphate gave good yields where applications had been made for 6 years, although acid phosphate caused somewhat higher yields.

Fall rains damaged open cotton on the ground raw rock phosphate plats more than that on acid phosphate plats. Cotton on the heavier soils showed less damage to lint than that from light soils. Sulfur and gypsum gave better results in cylinder experiments with cotton where phosphate was omitted from the mixture.

Ladino clover after producing 1 ton of hay in a cutting was pastured for 205 cow-days. This clover and hairy vetch were the only winter legumes not injured by the unusually cold weather, although enough subterranean clover survived to make a fair stand and to reseed itself thoroughly. Crimson clover on land never before in clover completely winterkilled but was not injured on rich land which had grown clover previously.

[Field crops work at the South Mississippi Substation, 1923 and 1924], E. B. Ferris and R. C. Price (*Mississippi Sta. Bul. 225 (1924), pp. 4–9*).—Experiments (E. S. R., 47, p. 428; 49, p. 428) reported on for 1923 and 1924 embraced varietal and fertilizer trials with cotton and corn, cultural tests with cotton, variously fertilized rotations, and a comparison of the calcium arsenate and Florida methods of boll weevil control.

[Agronomic investigations at Bari, Italy, 1922 and 1923], E. Pantanelli et al. (*Bari Staz. Agr. Sper. Relaz., 1922–1923, pp. 43–96, pls. 6*).—The progress of experiments noted earlier (E. S. R., 48, p. 434) is described.

South African Gramineae: Grasses of the Transvaal as represented in the National Herbarium, S. M. Stent (*Bothalia, 1 (1924), No. 4, pp. 222–303, figs. 9*).—The genera and important species of South African grasses are described with a key to the genera. The ecology of the grass flora of the Transvaal is discussed briefly.

The characteristics of winter and spring forms of cereals in relation to winter hardiness [trans. title], L. I. Govorov (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 13 (1922–23), No. 1, pp. 525–559*).—Studies on numerous wheat varieties at the Moscow Plant Breeding Station led the author to deny the existence of a strict correlation between morphological or anatomical characters and winter hardiness. Contrary to Sinz (E. S. R., 33, p. 235), a higher percentage of dry matter in the leaves did not seem related to a greater hardiness in winter wheats, nor did winter and spring plants differ in their percentages of dry matter. A connection between a greater hardiness in winter varieties and a deeper development of the tillering node below the soil surface was observed. The spring and tender winter varieties developed a higher tillering node at low temperature than at a high temperature, whereas the hardy kinds developed a lower tillering node at low temperatures. Moreover, this shortening seemed directly correlated with hardiness.

While hardy winter wheats have higher osmotic pressure of the cell sap than tender winter and spring sorts, and their leaves contain more glucose at low temperatures, no strict parallelism was seen between the bulk of these characters and the degree of winter hardiness in various sorts. The spring varieties showed a distinct decrease in glucose content on removal from high to low temperatures, while winter and tender winter sorts responded slightly or not at all to increased temperature. On the other hand, as compared to spring varieties winter wheats showed increased glucose contents after removal from high to low temperatures. Along with the increase of glucose in winter varieties at low temperatures went a proportionally larger decrease in respiration. With a rising temperature the spring varieties respired with greater intensity than winter sorts. So far as respiration and variation in glucose content were concerned, differences between spring and winter varieties were more pronounced in the first stage of tillering or in the period of full growth.

Under the conditions of the Moscow district greater hardiness is characteristic of the winter types, which with a lowering of temperatures accumulate more glucose and reduce their respiration, i. e., pass more rapidly to the state of anabiosis (E. S. R., 50, p. 231). Lack of oxygen due to a snow cover or tight soil is held to be an important cause of winterkilling.

Alfalfa in Pennsylvania, J. B. R. Dickey (*Penn. State Col. Ext. Circ. 104 (1924), pp. 14*).—Practical information on alfalfa production in the State.

Wisconsin's opportunity with alfalfa, R. A. Moore and L. F. Graber (*Wisconsin Sta. Bul. 374 (1925), pp. 32, figs. 30*).—The importance of alfalfa to the State is indicated, and approved production practices derived from experimental results obtained at the station (E. S. R., 49, pp. 31, 630; 51, p. 434) and cooperatively are described and illustrated pictorially and graphically.

The effects of frequent cutting on the production, root reserves, and behavior of alfalfa, N. T. Nelson (*Jour. Amer. Soc. Agron., 17 (1925), No. 2, pp. 100–113*).—The results presented in this paper were obtained from a continuation and elaboration of work already reported from the Wisconsin Experiment Station (E. S. R., 49, p. 630; 51, p. 434).

Frequent cutting of alfalfa in premature stages was found to result in depleted root reserves, which cause slow recovery and rate of growth after cutting, low yields of hay, increased weed infestations, and retarded root growth. Although an increase in the number of crown buds, shoots, and main stems is an immediate effect with frequent and early cutting, the average height and total yields of these top growths are much less than with fewer cuttings at a more mature stage.

Chemical analyses of alfalfa roots and physiological observations show that stored organic foods in the roots of certain plants such as alfalfa have an important influence on their productivity. Both the nitrogen and carbohydrate reserves of the root are decreased by cutting the crop too early.

Seed inoculation of lucerne (Medicago sativa) and its relation to the motility of the nodule organism in soil, H. G. Thornton and N. Gangulee (*Nature [London], 114 (1924), No. 2878, pp. 932, 933*).—When a bacterial culture (*Bacillus radicicola*) is applied in liquid suspension to alfalfa seed, each seed is coated with a film of liquid containing bacteria. There is evidence that after penetrating the tissues of the root, the bacteria are unable to pass along it for any significant distance. Consequently, when the seed has germinated, the bacteria must progress or be carried through the soil in order to reach from the seed coat to the different parts of the root system, where nodules are to be formed.

By a modification of Winogradsky's technique for staining bacteria in the soil, the authors found at Rothamsted that the nodule organisms will progress through light soil about 1 in. in 24 hours, although the rate is affected by soil texture. Bacteria suspended in milk began to spread through soil sooner than when suspended in water, possibly explaining the successful results obtained by applying bacteria suspended in skim milk to alfalfa seed.

The organisms commenced to spread almost immediately from the point of inoculation when sterile soil was inoculated with a suspension of bacteria in skim milk containing 0.1 per cent of soluble calcium phosphate. In pot culture tests of seed inoculation with alfalfa, such addition of phosphate to the milk containing bacteria evidently caused average increases in nodule numbers of 93 and 78 per cent in two experiments as compared to suspension in skim milk alone. A favorable effect was noted on the yield of the crop.

Varietal trials with barley in North Dakota, T. E. Stoa (*North Dakota Sta. Bul. 184 (1924), pp. 46, pls. 2, figs. 7*).—Grain yields obtained in compara-

tive trials of barley varieties conducted for various periods between 1892 and 1923 at the station, the Edgeley, Dickinson, Williston, Langdon, and Hettinger Substations, and the Northern Great Plains Field Station, U. S. D. A., at Mandan are tabulated and discussed in detail and summary form, with data on maturity, plant height, weight per bushel, rust infestation, covered and loose smut, and stripe disease. The progress of these trials has already been noted extensively. The plant and uses of barley are described, with comment on the commercial status of the crop and its importance in North Dakota. Important varieties are grouped systematically with brief descriptions. Tabulated precipitation data for the several localities are appended.

Manchuria strains of barley, particularly the pedigreed selection N. D. No. 2121, have been the best yielders at Fargo. Hannchen, a 2-rowed hulled variety, has averaged 7.7 bu. more per acre than the standard Manchuria strains during 16 years at Dickinson, and other 2-rowed varieties have generally outyielded the 6-rowed hulled varieties. At Edgeley, Hannchen in 4 years averaged 3.5 bu. more per acre than Manchuria. Other 6-rowed varieties such as Mariout, however, have outyielded Manchuria at Edgeley. Six-rowed and 2-rowed barleys have averaged about equally well at Langdon except during seasons having low temperatures and otherwise favorable growing and maturing conditions, when 6-rowed barleys excelled. Hannchen, Hanna, Manchuria, and Oderbrucker were among the leaders at Williston. Other 2-rowed sorts did not yield as well as Hannchen. At Mandan, with conditions very similar to Dickinson, 2-rowed barleys have been decidedly the best yielders. Mariout has been superior to Manchuria but did not equal Hannchen in yields.

The hulled-hooded and naked barleys have yielded decidedly less than the hulled-awned varieties at all the stations and can not be generally recommended. Naked barley, however, has yielded fairly well at Edgeley.

Experiments and observations on forms and strains of Trifolium repens L., W. M. WARE (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 1*, *pp. 47–67*, *pl. 1*).—Attention is called to morphological and physiological variation in white clover. The constancy of certain characters was determined.

Cyanogenesis was not found correlated with any recognizable external feature of the plant, and has been constant from year to year and under different soil conditions. A study of the distribution of cyanogenetic and acyanogenetic forms of white clover showed that plants of these types give rise under open pollination to offspring about 75 per cent of which have like cyanogenetic characters. No connection was noted between the feeding quality of certain pastures and the cyanophoric or acyanophoric character of the white clover found therein. Both physiological forms occur in old pasture.

Pollination experiments showed that hybridization takes place between separate individuals of white clover even of different forms or strains. Heads of florets protected from insects remained barren, and purely mechanical tripping of the florets without transfer of foreign pollen gave only negative results. No useful seeds were produced by self-pollination.

The effectiveness of seed corn selection based on ear characters, F. L. WINTER (*Jour. Amer. Soc. Agron.*, *17* (*1925*), *No. 2*, *pp. 113–118*).—In an experiment at the University of Illinois to determine the effectiveness of selecting seed corn by means of ear characters as demonstrated by the germination test, the results showed significant differences in favor of ears selected for seed on the basis of their physical characters over those discarded, in viability of seeds, vigor of seedlings, and amounts of disease (with the exception of Scutellum rot).

Field experiments with maize, G. NICHOLSON (*Agr. Gaz. N. S. Wales*, *36*

at Grafton, N. S. Wales, reduced grain yields nearly 10 per cent, and the fodder value of the suckers barely paid for the cost of harvesting them.

The effects of heat treatment of cotton seed on its germination and on the subsequent growth and development of the plants, J. Templeton (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 48 (1924), pp. 1+9, pls. 3*).—Field and laboratory tests failed to show that cotton seed which had been subjected to 57° C. (134.6° F.) for about two minutes to kill pink bollworm was adversely affected as to germination. Heating the seed did not seem to affect the blooming or yield of the resultant plants.

Cotton experiments, 1924, J. F. O'Kelly and R. Cowart (*Mississippi Sta. Bul. 226 (1924), pp. 3-12, fig. 1*).—Cook and Cleveland cotton have produced the largest average yields during recent years at the station (E. S. R., 50, p. 735), and Delfos and Trice have led in acre value. Cleveland strains, Willis, and Miller ranked high in value in 1924, and D. & P. L. No. 4, Miller, and Cleveland strains led on poor hill lands. Varieties ranked in apparent resistance to wilt were Cook (Rhyne), Cook 307-6, Solomon and Oates Big Boll, Dixie Triumph, Toole (Wilkinson), Miller, Cleveland 54, Salsbury, and Willis.

Comparison of nitrogen sources indicated that the best nitrogen carriers will be profitable when applied at an acre rate equivalent to 100 lbs. of sodium nitrate. The difference between kainit and Kemfert, as shown by increases in cotton yields, was negligible, and potassium in the form of sulfate or chloride seemed to be as efficient per pound of potash as kainit. Other fertilizer tests with cotton are reported briefly.

Report on southeast Missouri cotton experiment fields, 1924, B. M. King (*Missouri Sta. Circ. 132 (1925), pp. 4*).—Experiments on seven fields in southeastern Missouri indicated that, of the best adapted varieties, Trice and Delfos are best suited to the heavy soils and to certain light soils and Acala and Express to light sandy soils. In general, sodium nitrate should not be applied alone, whereas acid phosphate alone may be profitable on most soils in the region. A high grade complete fertilizer, or a combination of acid phosphate and potassium chloride will generally give good returns over a wide range of soil types and conditions. From 2 to 4 plants in hills 10 or 12 in. apart gave the best returns on deep sandy soils, while on silt loam or silty clay loam single plants 12 in. apart yielded as well as from 2 to 4 plants in hills 12 in. apart.

Ginning Pima cotton in Arizona, J. S. Townsend (*U. S. Dept. Agr. Bul. 1319 (1925), pp. 12, pls. 11, fig. 1*).—A survey of the diverse methods used in ginning Pima cotton showed that appreciation of the need of using the same methods and precautions in the construction, adjustment, and operation of roller gins and in handling the cotton from the gin to the finished bale would make possible a much greater uniformity in the appearance of baled lint and of commercial samples. The principles and requirements of normal gin operation are stated briefly, with a description of an attachment devised for removing the lint from the gin roller in a manner that straightens the fibers and improves the appearance of the cotton, so that higher commercial grades are obtained.

The 1924 cotton survey of the Salt River Valley, R. S. Hawkins, S. P. Clark, and I. A. Briggs (*Arizona Sta. Timely Hints for Farmers, No. 150 (1925), pp. 15, fig. 1*).—About 138,000 acres of cotton were grown in the Salt River Valley in 1924, Pima cotton being planted on 8,000 acres. An increase of about 14 per cent in cotton acreage is indicated for this district in 1925 with about 39 per cent of the 1925 acreage devoted to Pima cotton, 38 to Acala, 12 to Hartsville, and 10 per cent to Mebane. The yields, maturity, stands, and

number of cultivations and irrigations for these varieties on six soil types and their yields as affected by time of planting are compared with those recorded in the previous year (E. S. R., 51, p. 338).

Flax in Oregon, G. R. HYSLOP (*Oregon Sta. Circ. 60 (1925), pp. 3–10*).—Practical information on the environmental and cultural requirements for seed and fiber flax growing in Oregon is given with comment on harvesting and retting.

Weed eradication in flax fields by chemicals [trans. title], L. RITTER (*Abs. in Melliand's Textilber., 6 (1925), No. 2, p. 121*).—In experiments at the University of Giessen wherein copper sulfate, iron sulfate, kainit dust, and lime nitrogen were used, flax withstood iron sulfate the best. This chemical was also the safest in damp years. Lime nitrogen injured the flax as much as the weeds, and copper sulfate damaged the weeds very little. Kainit dust destroyed the weeds in dry weather or else retarded their development.

Hemp in Germany, O. HEUSER (*Der Deutsche Hanf. Leipzig: S. Hirzel, 1924, pp. X+92*).—Endeavoring to present recent observations and results of experiments with hemp, the book traces the development of hemp culture in Germany; describes the plant, varieties, structure of the stalk, and the fruit; outlines environmental and cultural requirements, harvesting, breeding, and retting practices, and handling of the fiber; and discusses the economic phases of the industry. A bibliography on hemp is appended.

Influence of nutrition on fiber production in bast fiber plants [trans. title], W. KRÜGER, G. WIMMER, and G. BREDEMANN (*Ernähr. Pflanze, 19 (1923), No. 13–14, pp. 89, 90*).—Soil type and nutrition affected fiber production in the nettle (*Urtica dioica*) in earlier tests. In the experiments here reported, enhanced fiber content followed increases in the potassium application, whereas increasing nitrogen and phosphorus seemed of rather doubtful value. The separation of the fiber from the stalks and the fiber color after separation (snow-white to brownish-yellow), which are closely related, were likewise influenced by potassium. The most favorable ratio of nitrogen to potash in the fertilizer was 1:2.5.

Fulghum oats for Missouri, L. J. STADLER (*Missouri Sta. Bul. 229 (1925), pp. 19, figs. 8*).—Fulghum oats (E. S. R., 46, p. 134) averaging 46.1 bu. per acre outyielded all other varieties in a 6-year variety test, exceeding Burt by 5 per cent, Kherson by 12, and Silvermine by 17 per cent. The yield of Fulghum was greatly affected by time of seeding, the average loss from a month's delay in seeding being 24 bu. per acre, or 45 per cent. Since Kherson is much less affected by delayed seeding, the relative yield of the two varieties depends on the time of seeding. With very early seeding Fulghum is far superior to Kherson, with average seeding only moderately superior, and with very late seeding is somewhat inferior to Kherson.

Seven commercial stocks of Fulghum obtained from widely different sources did not differ materially in average yield in a 4-year comparison, and all were consistently better than the other standard oats varieties for Missouri. Fulghum oats exhibited very high resistance to the oats smuts. Seed treatments for smut control are held unnecessary when this variety is grown.

The culture and improvement of oats in relation to our peaty soils [trans. title], Å. ÅKERMAN (*Svenska Mosskulturför. Tidskr., 39 (1925), No. 1, pp. 31–62*).—A paper presented at a meeting of the Swedish Moor Culture Association, in which the relative importance of oats culture in Sweden is brought out and the work of improving the crop as carried on by the leading plant breeders and others is reviewed. The improvement work is discussed from the standpoint of better yields, greater hardiness in disease resistance,

and special adaptation to the different soil conditions of southern, middle, and northern Sweden. The principal varieties are described and their histories briefly noted.

Producing seed peas in Montana, C. McKee (*Montana Sta. Circ. 128 (1925), pp. 24, figs. 5*).—Varieties, environmental needs, cultural practices, rotations, roguing, and harvesting methods involved in the production of seed peas in Montana are described, with a typical grower's contract used by seed companies.

The peanut (Arachis hypogaea)—its history, histology, physiology, and utility, R. A. Waldron (*Penn. Univ. Bot. Lab. Contrib., 4 (1919), No. 2, pp. 301–338, pls. 2, figs. 3*).—This treatise comprises an historical account of the peanut, descriptions of the plant and important varieties, notes on the uses of the crop, and the results of investigations concerning its histology and physiology.

Biological observations on the peanut [trans. title], F. F. R. Heide (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Alg. Proefsta. Landb., No. 14 (1923), pp. 5–19, figs. 3*).—Experiments in Java showed that in comparison with seed of the common European cereals and legumes, peanuts are only slightly sensitive to chemicals, withstanding 1 per cent of copper sulfate, 3 per cent of calcium chloride, and 0.1 per cent of oxalic acid, but only 0.5 per cent of sodium chloride. Cleistogamic flowers appear to be exceptional. The normal chasmogamic flowers are not visited by insects during the dry monsoon when many honey flowers are open, whereas several insects pollinate peanut flowers in the wet season. The peanut can ripen pods and peas normally without contact with the soil in light as well as in the dark. While the ability of the ripening pods to absorb water from the soil is much less than that of the roots, it is greatly increased if the root system fails to function.

The cutting of potato sets, J. H. Priestley and G. C. Johnson (*Jour. Min. Agr.* [*Gt. Brit.*], *31 (1925), No. 11, pp. 1012–1021, pls. 3*).—Field experiments with several varieties of potatoes in different localities in Great Britain gave evidence that cut sets protected from sun and drying wind have generally outyielded those cut and exposed to the sun and dry air for several hours. A related technical discussion of the healing of wounds in potato tubers and their propagation by cut sets has been noted (E. S. R., 52, p. 218).

[Hardiness and resistance of perennial rye grass], C. O. Jørgensen (*Nord. Jordbrugsforsk., 1924, No. 6, pp. 411–417*).—The general behavior of perennial rye grass in Denmark and Sweden is discussed, and the results of several comparative tests of grass mixtures containing the species are reported. It was found that white clover and blue grass were much hardier and more lasting than perennial rye grass, which did not maintain itself very long in the stands produced. It is pointed out that strains of this grass varying in hardiness and disease resistance have been observed, and that plant breeding work should be undertaken to obtain strains of sufficient winter hardiness and disease resistance to suit the climatic conditions of Denmark.

C. H. 64(21) or Super-Uba sugar cane [trans. title], E. M. and M. Calvino (*Chaparra Agricola, 1 (1924), No. 7–8, pp. 1–12, figs. 4*).—Cuba hybrid 64 (1921), derived from Uba×D.74, had 14.5 per cent sucrose in its juice 27 months after planting, and 8.66 per cent of fiber in ratoons, apparently inheriting the low fiber content of D.74. Although planted in an infected field, C. H. 64(21) did not exhibit mosaic disease.

C. 35 or Super-Cristalina sugar cane [trans. title], E. M. and M. Calvino (*Chaparra Agricola, 1 (1925), No. 9, pp. 1–11, figs. 2*).—C. 35, a seedling sugar

cane obtained from D.74 seed and subsequently improved by bud selection, is said to have juice with a sucrose content ranging from 15.87 to 18.8 per cent, and to produce high cane yields. The variety is described with remarks on its propagation.

The spacing of sugar cane [trans. title], T. A. Tengwall (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1924, No. 18, pp. 525–595, figs. 3; abridged in Facts About Sugar, 20 (1925), No. 5, pp. 106, 107, figs. 3*).—The results of 692 field tests made during 15 years on different soils in Java are summarized in this review.

Reducing the distance between rows increases the number of stalks per unit area, and generally the higher sugar yields accompany the higher cane yields. The percentage of lodging was larger in the narrow than in the wide rows. The sugar production is influenced little or none by the wider spacing but is strikingly affected as the rows become closer. Study of 584 field tests showed that the average spacing in the years 1913–1923 varied from 3 ft. 10 in. to 4 ft. 3 in. (the Dutch foot equals 1.03 English feet), while the optimum spacing varied from 3 ft. 10 in. to 4 ft. When plentiful rainfall occurred in October and November of the planting years the optimum row distance was narrower than in dry years. The optimum was narrower in late than in early plantings, but was wider on heavy than on light soils.

The optimum spacing for E. K. 28 and 100 P. O. J. was evidently narrower than for 247 B. and D. I. 52. E. K. 28, which shows the least tendency to stool, has the narrowest optimum. No relation between spacing and stooling was noted among the other varieties. The spacing most common in Java is 4 ft. between centers. Because of the extensive use of E. K. 28 the spacings are closer than formerly and tend to approach 3.5 ft. The row space is generally narrower in east Java than in west or middle Java, while on the northern coast it may vary from 3.5 to 5 ft. In middle and western Java 4- and 4.5-ft. spacings have outyielded 5-ft. rows.

Fertilizer tests involving different amounts of ammonium sulfate on different spacings were rather inconclusive.

Plantings in double rows were inferior to those in single rows both in cane yield and sugar production. Cane in 3-ft. checked hills excelled that in 3.5-ft. checks and was decidedly superior to that in 4-ft. checks. However, the ordinary method of trench planting is preferred since checking is more expensive.

[Sunflowers and sunflower seed], F. T. Shutt (*Canada Expt. Farms, Div. Chem. Interim Rpt., 1922, pp. 90–102*).—Analyses of sunflowers in progressive stages of growth and at different spacings were made for their bearing on cultural, feeding, and fertility problems. A crop yielding 15 tons per acre was estimated to take from the soil 69 lbs. of nitrogen, 42 of phosphoric acid, and 246 of potash as compared with 66, 33, and 120 lbs., respectively, in the same amount of silage corn.

A low weight per 1,000 seed seems to be associated with a relatively high proportional weight of kernel and, vice versa, high weight of seed means a relatively low weight of kernel and high weight of hull. A high weight of seed is also associated with a high fiber content of seed. While degree of maturity at time of harvest may influence the composition of sunflower seed, preliminary study suggests that heredity is more potent. A high oil content was associated with low protein, and vice versa.

Germination of hulled timothy seed, O. A. Stevens (*Seed World, 17 (1925), No. 4, p. 14*).—Tests on numerous samples at the North Dakota seed laboratory indicated that hulled timothy seed germinates about as well as

unhulled seed when fresh but loses its vitality more rapidly, becoming of poor quality in two or three years.

The effect of distancing on tobacco leaf, S. B. Imatong (*Philippine Agr., 13 (1924), No. 7, pp. 289–297, figs. 5*).—Different varieties of tobacco seemed to require different spacings in experiments at Los Baños. Height of plant and size of leaves were both affected by distance of planting, the maximum weight of leaves per unit area being obtained in close plantings, although these leaves were much reduced in size. Superior burning quality was found in the leaves produced in close plantings, possibly because such leaves were rather thin and had small veins, undeveloped midribs, and little gummy substance.

Bright tobacco production, E. C. Westbrook (*Ga. Agr. Col. Bul. 199, rev. (1925), pp. 40, figs. 13*).—A revision of a treatise noted earlier (E. S. R., 45, p. 344).

Physiological characters of xerophytic wheats [trans. title], A. Potapov (*Sborn. Mater. Izuch. Selsk. Khoz. Sibiri, No. 1 (1924), pp. 37–62*).—An account of transpiration and respiration experiments conducted with several important Siberian wheats at the Tulun Agricultural Experiment Station is presented with a critical review of previous work. An attempt is made to give a valid physiological definition of drought resistance in wheat.

Neither anatomical nor transpirational coefficients seem to be reliable guides in selecting drought-resistant races. Low transpiration is not typical of xerophytes, and efforts to find low transpiring varieties may lead to the selection of nonresistant strains. The conception of drought resistance suggested is that of a sum of nonhomogeneous and mutually exclusive phenomena. Drought resistance does not seem to exist as an independent definite physiological character. Wheat xerophytes may be characterized as distinct biotypes with a greater vigor.

Relation of flour yield to test weight per bushel, J. H. Shollenberger (*Amer. Miller, 53 (1925), No. 3, p. 293*).—The average yield of straight flour obtained from wheats of different test weights from each of the five commercial classes are tabulated from tests made by the U. S. Department of Agriculture on samples of the crop years of 1915 to 1924, inclusive. A fairly uniform decrease in yield of flour was shown with each decrease in test weight. The hard red winter wheats consistently yielded the largest percentage of flour.

Results of seed and legume inoculant inspection, 1924, J. G. Fiske (*New Jersey Stas. Bul. 412 (1925), pp. 72, fig. 1*).—The purity and germination are tabulated for 731 samples of field crops seed, 617 samples of garden seed, and 23 lawn mixtures tested during 1924. The crops and inoculation, number of organisms, and viability guaranties are shown for 33 official samples of legume inoculants.

[Seed inspection in North Carolina], J. L. Burgess (*N. C. Dept. Agr. Bul., 1925, Jan., pp. 4–11*).—Tabulations show the average germination and purity of 1,535 samples of field crops seed, and the average germination of 412 samples of vegetable seed, 7 of herbs, and 103 samples of flower seed, collected in North Carolina during the year ended November 1, 1924.

The Seeds Act, 1923, with the regulations made by the minister of agriculture (*Ottawa: Canada Dept. Agr., Seed Branch, 1924 [rev. ed.], pp. 30*).—Regulations made in pursuance of the Seeds Act, 1923 (E. S. R., 50, p. 539) effective in October, 1924, are set forth.

A new noxious weed in California, E. Johnson (*Calif. Dept. Agr. Mo. Bul., 12 (1923), No. 3–4, pp. 99–106, figs. 8*).—Russian knapweed (E. S. R., 47, p. 830), a serious weed pest introduced into California and other western States probably in imported commercial Turkestan alfalfa seed, is a deep-

rooted, creeping perennial growing so densely as to crowd out field crops and spreading from pieces of the root as well as from seed. Experiments in California indicate that under certain conditions it may be eradicated by applying carbon disulfide to the soil, and probably also by continuous plowing for two successive seasons. The plant and its distribution in California are described.

Notes on the control of water weeds, A. A. Hansen (*Jour. Amer. Soc. Agron., 17 (1925), No. 2, pp. 119, 120*).—Methods for the control of water weeds discussed briefly include hand cutting; drags of saws, blades, and chains; swans and ducks; and chemical plant poisons.

HORTICULTURE

[Horticultural investigations at the Georgia Station] (*Georgia Sta. Rpt. 1924, pp. 83–85*).—This is the usual annual progress report (E. S. R., 51, p. 140). As a result of an unusual freeze, occurring January 4 and 5, 1924, mature peach trees suffered serious injury, evidenced by a blackening of the cambium layer just above the ground line. Death occurred in some trees immediately, in others following blossoming, and in still others succeeding fruiting. The Carman variety was peculiarly susceptible to winter injury.

Two years' tests of the New Jersey dry-mix summer spray indicated satisfactory control of brown rot without injury to the trees. A spray manufactured with the aid of artificial heat from hydrated lime and sulfur was found equally as satisfactory as the self-boiled material.

Pecans showed little injury from the freeze which severely injured peaches. The Van Fleet raspberry was found the most promising of 26 varieties tested.

Report of horticultural work at the South Mississippi Experiment Station for 1923–1924, W. S. Anderson and F. B. Richardson (*Mississippi Sta. Bul. 225 (1924), pp. 9–19, figs. 2*).—In addition to brief varietal notes on a large number of fruits and vegetables, there are presented the results of miscellaneous investigations.

That mounding citrus trees with soil as a protection against cold is an effective measure was indicated in the satisfactory recovery of trees following a severe freeze in January, 1924. The strong shoots, emerging below the point of injury on Satsuma trees gave every promise of quick renewal of the tree top.

Data on the first fruit from a peach orchard pruned in various ways showed that although unpruned trees were decidedly the most productive, the fruit was small, poorly colored, and difficult to pick as compared with that of pruned trees. The fact that fig trees growing in sod suffered more winter injury than those on clean-culture plats is believed to be due to their weak vegetative condition. Nematode infestations also were found greater on figs in the cultivated plats. In the case of the peach, trees on the alternating clean-culture and sod plats showed 73 per cent of nematode infestation as compared with 0 per cent on the permanent sod and culture plats. Peach trees in sod dropped their leaves earlier in the fall and blossomed earlier in the spring than did tilled trees.

The application to the surrounding soil of a proprietary sulfur compound had no effect on vinifera grapevines. Of six varieties of strawberries, namely, Klondike, Gandy, Missionary, Aroma, Lady Thompson, and Progressive, tested in 1923 and 1924, the Lady Thompson was the most productive and the Klondike the most desirable from a commercial standpoint.

Vegetable varieties for North Dakota, A. F. Yeager (*North Dakota Sta. Bul. 187 (1925), pp. 26, figs. 9*).—Arranged under their respective species, there

are presented tabulated lists of vegetable varieties which have been tested at the station in recent years, the most promising being denoted with asterisks.

Tariff information surveys on articles in paragraph 762 of the Tariff Act of 1922.—Onion seed (*Washington: U. S. Tariff Comn., 1925, pp. III+17*).—Information of a statistical nature is presented on the domestic and foreign production of onion seed, imports, exports, costs, etc.

Chemical changes during the growth and ripening of pea seeds, V. R. Boswell (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 178–187*).—Analyses, at the University of Maryland, of Alaska and Nott Excelsior peas harvested at various stages of development, as determined by a definite number of days subsequent to blossoming, showed very rapid changes in chemical composition during development and ripening. Late harvested peas of a single variety were found to have a distinctly lower sugar content and a higher starch and total polysaccharide content than those gathered in a relatively immature but edible condition. Of the two varieties utilized in the investigation, the Nott Excelsior, a high quality pea, was found to contain much more sugar and less insoluble, nonhydrolyzable substances than did the Alaska, a variety of medium to low quality.

In summation, the author points out that growth and ripening processes in pea seeds are characterized by (1) a rapid decrease in sucrose, total soluble nitrogen, amides, basic nitrogenous substances, amino acids, and materials which form humin compounds upon hydrolysis, (2) an increase in starch, hydrolyzable polysaccharides, and insoluble nitrogen, and (3) a less rapid decrease in total nitrogen. It is suggested that, in order to preserve quality, peas should be harvested promptly upon the attainment of marketable size.

The relation of chemical composition to the regeneration of roots and tops on tomato cuttings, A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 187–194, pls. 4*).—Observations at the University of Maryland on the root and leaf development of John Baer tomato cuttings taken from nonvegetative and strongly vegetative plants showed a fairly definite relation between the chemical content of the cuttings and the kind and amount of the resulting regeneration.

The high carbohydrate and relatively low soluble nitrogen content of cuttings taken from nonvegetative plants favored root formation, while, on the other hand, a low carbohydrate content and a relatively high soluble nitrogen supply in cuttings taken from strongly vegetative plants favored top regeneration. In those cuttings in which there was an abundance of both carbohydrates and soluble nitrogen there occurred an abundant growth of both roots and tops. Cuttings containing practically no soluble nitrogen made extremely poor root growth irrespective of carbohydrate content, and, conversely, in the case of cuttings having a high soluble nitrogen and a very low carbohydrate content, a condition typical of the succulent shoots of strongly vegetative plants, no growth of tops or roots occurred.

That root development of cuttings is quantitatively related to the volume of the cutting was shown in a study of cuttings taken from the tip, middle, and basal portions of the stem of nonvegetative plants. The average weight of cuttings was 0.63, 1.19, and 1.87 gm. respectively. After a period of 10 days the basal cuttings had both roots and small shoots, the middle cuttings possessed a few small roots and a single shoot, while the tip cuttings had developed only a few roots.

The effect of some spraying materials upon the rest period of fruit trees, W. C. Dutton (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 176–178*).—Investigations conducted at the Michigan Experiment Station with twigs taken

from peach and pear trees sprayed with various materials indicated very significantly that certain substances are effective in breaking the rest period of plants.

Twigs taken from Kalamazoo and Fitzgerald peach and Clapp Favorite pear trees which had been sprayed in late November with lime sulfur, soluble sulfur, Scalecide, Sunoco spray oil, and nitrate of soda were found, when placed in a greenhouse, to vary markedly in the time of bud development. Records taken on the Kalamazoo peach and the pear 33 days after spraying and 21 days after cutting from the tree showed control shoots and those sprayed with lime sulfur to be inactive, while those taken from the soluble sulfur and nitrate of soda sprayed trees were very active. The results with Scalecide were not satisfactory, the pear buds apparently being killed outright and the peach buds, though showing temporary activity, evidently injured. Records taken 12 days later showed the control and lime sulfur twigs still dormant, while the soluble sulfur and nitrate of soda twigs were continuing growth, although all buds did not develop equally. Shoots of the Fitzgerald peach did not show any effects of the spraying treatments, all lots developing more or less uniformly.

Observations on a second group of shoots cut January 3 failed to show the effects of spraying treatments on the peach except where injured. The author suggests that probably at this time the rest period had been broken by natural agencies. With the pear, soluble sulfur and nitrate of soda again stimulated growth renewal. No evidence was found of any carry-over effects on the spring development of either the pear or the peach.

Copper hydroxide as a substitute for Bordeaux, H. D. Hooker, Jr. (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 173–176*).—Copper hydroxide prepared, as outlined in the text, in the form of a highly hydrated colloidal precipitate, was found capable of sustained suspension in ordinary water and, on the basis of actual copper content, to be approximately 15 times as effective as Bordeaux mixture in the control of apple scab, apple blotch, and cherry leaf spot. Furthermore, when applied alone, the copper hydroxide left no stain on the fruit, and thus showed value as a late spray for cherries and apples. The fact that copper hydroxide possesses the same fungicidal and burning properties as Bordeaux is deemed to indicate that the hydroxide is the effective agent in Bordeaux mixture, the superior quantitative value of the hydroxide apparently lying in its capacities for high dispersion, favoring an extremely uniform and even distribution over the plant's surface.

Since copper is a catalyst capable of oxidizing exceptionally inert compounds and the degree of dispersion is one of the chief factors affecting the action of the catalytic agents, the author suggests that the fungicidal and burning properties of copper sprays probably depend upon the catalytic action of copper in effecting oxidation rather than on any direct toxic action.

Blackberry, raspberry, and dewberry culture, H. G. Swartwout (*Missouri Sta. Bul. 231 (1925), pp. 24, figs. 11*).—Accompanying general cultural information, there are presented in tabular form the yields of numerous raspberry and blackberry varieties, some grown at Columbia, some at Turner, and some at both places.

Gooseberries and currants, H. G. Swartwout (*Missouri Sta. Bul. 232 (1925), pp. 12, figs. 5*).—A presentation of general cultural information, discussing soils, varieties, propagation, planting, culture, pruning, harvesting, spraying, etc.

Fertilizing citrus trees in California, R. W. Hodgson (*California Sta. Circ. 283 (1925), pp. 22*).—This, a summation of the present knowledge of

citrus fertilization in California, points out that investigations to date have shown that citrus trees require fertilization, and that nitrogen and organic substances are the only materials which have shown significant effects on yield and vigor. From 2 to 3 lbs. of nitrogen per tree per year was shown to be the most profitable quantity under ordinary conditions. Although no one source of nitrogen was found best, it is deemed certain that part should be in the form of bulky organic matter. Whether the nitrogenous materials are in quickly or slowly available form is dependent principally upon the time of application. In general, bulky materials, with the exception of quickly available forms, should be applied in the fall, and concentrates in the spring. Deep application, wherever possible, was found most satisfactory.

Winter cover crops had a pronounced fertilizer value in citrus orchards, stimulating growth and production in the young orchard and replacing from 3 to 5 tons of manure in the bearing orchard. The use of lime, gypsum, sulfur, and other soil amendments was rarely productive of measurable benefits. Peat, because of its slow decomposition, was not found to be a satisfactory substitute for manure.

In concluding, the author presents fertilizer programs for young and bearing citrus orchards.

Variation in coconuts with particular reference to fruit production, H. W. Jack (*Malayan Agr. Jour., 13 (1925), No. 2, pp. 25–63, pl. 1*).—A statistical study of individual yield records taken on a block of 475 coconut palms growing on a well-drained and well-managed Malayan estate showed great variability in the production per tree during the four years 1920–1923. With pickings every five weeks, the calculated mean production per picking for each palm during the four years was 5.78 nuts. The maximum production, 12 nuts per picking, was attained by two trees. Low production in the case of 18 trees was observed to be distinctly associated with an upward branching habit. Determinations of the amount of copra per nut for 17 palms indicated variations sufficient to justify selection on the basis of high copra production. The fact that there was no apparent grouping of good or poor producing trees is believed by the author to indicate that variations found in productivity were not due to soil variations, but rather to inherent tendencies in the trees themselves. In general conclusion, he suggests that the results of the study indicate the value of tree selection in the propagation of the coconut.

Preliminary pecan experiments, F. Garcia and A. B. Fite (*New Mexico Sta. Bul. 145 (1925), pp. 18, figs. 7*).—Although the pecan is not native to New Mexico, preliminary investigations conducted at the station indicate that certain varieties may be of value, at least in some of the more favorable agricultural locations. Of numerous varieties planted in 1916 on a sandy loam, which had proved very satisfactory for peach growing, the Stuart, Texas Prolific, and Pabst, though slow and delicate in getting started, showed considerable promise. The Success appeared a little hardier than other paper shell varieties, and, among northern types, the Indiana was the most promising. The investigation showed that the first two years following transplanting are the most critical, the tree at this time being slow in developing a root system. Because of a tendency to break down in wind storms, it is advised that pecan trees be pruned according to the central leader system. Tabulations of yields for 1921–1924 are given.

A little book of modern dahlia culture, W. H. Waite (*New York: A. T. De La Mare Co., Inc., 1925, pp. 126, pls. 2, figs. 24*).—A presentation of brief notes on the preparation of the soil, planting, propagation, culture, varieties, etc., of the dahlia.

Rural highways, C. P. Halligan (*Michigan Sta. Spec. Bul. 138 (1925), pp. 3–20, figs. 14*).—An illustrated pamphlet containing suggestions and plans for the beautification of the rural highways, urging the full utilization of natural features such as lakes, broad views, etc. It is recommended that plantings should preferably be informal and natural, using, wherever possible, native species. Billboards and other objectionable features should be excluded from the vicinity of the highway.

Trees and shrubs hardy in the British Isles, W. J. Bean (*London: John Murray, 1925, 4. ed., vols. 1, pp. XVI+688, pls. 36, figs. 122; 2, pp. [7]+736, pls. 28, figs. 136*).—This is a fourth edition of the work previously noted (E. S. R., 48, p. 736).

FORESTRY

A guide to the trees, C. C. Curtis (*New York: Greenberg, 1925, pp. [5]+208, figs. 213*).—A small handbook designed for the ready identification of trees and shrubs growing in the northeastern part of North America.

Let's know some trees: Brief descriptions of the principal California trees, C. H. Shinn (*U. S. Dept. Agr., Misc. Circ. 31 (1925), pp. II+16, figs. 13*).—This pamphlet contains brief popular descriptions of the principal California trees and is designed to assist in their identification.

Familiar flowering trees in India, I. Colthurst (*Calcutta: Thacker, Spink & Co., 1924, pp. [10]+167, pls. 5, figs. 56*).—This illustrated handbook, containing descriptions of some of the more important flowering trees of India, is designed to serve as a ready guide to their identification.

Notes on the cause of eccentric growth in trees, C. E. Behre (*Jour. Forestry, 23 (1925), No. 5–6, pp. 504–507, figs. 3*).—Observations made at Upton, Me., upon leaning red and white spruce trees in which the crown was entirely confined to the upper side of the stem showed, with no exception, the maximum radial development on the lower side of the trunk. Again, in the case of a white spruce, the branching of which on one side had been prevented by crown friction with the neighboring tree, observations showed growth above the root swelling to be practically concentric. The author believes, therefore, that eccentricity in trunk development is due to gravitational or mechanical stimuli, as suggested by Burns (E. S. R., 45, p. 819), rather than to the results of uneven distribution of photosynthetic activity and associated food supplies, as suggested by Fritz and Averill (E. S. R., 52, p. 144).

Fumigating and sterilizing tree seed, W. Metcalf (*Jour. Forestry, 23 (1925), No. 5–6, pp. 508–512*).—The need of sterilizing forest seeds designed for foreign shipment during the foot-and-mouth disease epidemic in California led to a test of the effect of various fumigating materials, including formalin gas, formalin solution, hydrogen peroxide, mercury bichloride, sulfurous and sulfuric acids, etc., upon germination.

Based on 30-day tests in a regulated germinating oven, mercury bichloride, hydrogen peroxide, and the formalin solution reduced the germination of redwood seeds 6, 6, and 8 per cent, respectively, below the control. Mercury bichloride, because of its disease controlling capacities, its comparatively low cost, and its ease of application, is deemed the most satisfactory material for sterilizing redwood seeds. With Douglas fir, the germination of whose seeds was incomplete in 30 days and therefore could not be recorded at that time, the sulfurous acid exerted a remarkable effect on hastening germination. The seeds so treated germinated 54 per cent as compared with an average of 16 per cent for all the other treatments.

The Italian turpentine industry [trans. title], F. C. PALAZZO (*Nuovi Ann. Agr.* [*Italy*], *4* (*1924*), *No. 1, pp. 3–49, figs. 4*).—Beginning with a brief discussion of the location and development of the turpentine industry in Italy, the author discusses different methods of tapping, comparing them in regard to resulting yield and effect on the trees, and reviews experiences with different species of pine.

Forest mensuration, H. H. CHAPMAN (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1924, 2. ed., rev., pp. XXII+557, figs. 88*).—A second edition of a previously noted work (E. S. R., 46, p. 341).

Annual progress report of the administration in Ajmer-Merwara forests for the year 1923–24, B. DAYANAND MAMGAIN (*Ajmer-Merwara Forest Admin. Ann. Rpt. 1923–24, pp. V+39*).—This is the usual annual report (E. S. R., 51, p. 44).

Annual progress report on forest administration in the Presidency of Bengal for the year 1923–24, J. HOMFRAY (*Bengal Forest Admin. Ann. Rpt. 1923–24, pp. [4]+40+3, pl. 1*).—This is the usual annual progress report (E. S. R., 50, p. 838), containing general information concerning the management of the State forests.

Progress report[s] on forest administration in the North-West Frontier Province for 1922–23 [and] 1923–24, E. A. GRESWELL and G. R. HENNIKER-GOTLEY (*Northwest Frontier Prov. Forest Admin. Rpts., 1922–23, pp. [14]+22+XLIII; 1923–24, pp. [13]+6+III+27+LIII, pl. 1*).—These two reports covering the fiscal years ended March 31, 1923, and March 31, 1924, contain the usual administrative data concerning alterations in area, silvicultural management, revenues, and expenditures, tabulated data, etc. (E. S. R., 51, p. 347). In addition, the second report contains A Summary of Progress of Forest Administration in the Northwest Frontier Province during the Quinquennium 1919–20 to 1923–24.

DISEASES OF PLANTS

Virus diseases of plants, P. MURPHY (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91* (*1923*), *p. 492*).—Recent researches in plant pathology have shown that a number of obscure maladies are really infectious diseases of the so-called virus type, comparable to some of the most serious diseases of man and animals, and not mere conditions of ill health resulting from old age or from unfavorable environmental or cultural conditions. A brief account of these investigations is given, particularly as regards potato curl, which is analyzed and described. The traditional control measures are considered in the light of the new conception, and a sketch is given of the new avenues of approach to more rational and effective methods of combating the disease.

So-called "virus diseases" of plants: Their symptoms, causation, mode of dissemination, and economic importance from a physiological point of view, H. M. QUANJER (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91* (*1923*), *pp. 492, 493*).—Opinion was formerly divided in ascribing so-called virus diseases to physiological influences, degeneration, and parasites. In the majority of fungus, bacterial, nematode, and insect diseases attacks are local, but in so-called virus diseases these are general. In animal diseases, spreading through blood vessels is possible. The plant tissue most comparable with blood vessels is the sieve-tube system. Diseases which spread through sieve tubes are more generalized in the host than are most other diseases. The hypothesis that in virus diseases the phloem is the seat of disturbance is confirmed by microscopical evidence in the case of potato leaf roll, beet curly top, and raspberry

leaf curl; physiological evidence by prevention of movement of assimilates in the same diseases and in others, as peach yellows and sandal spike; experimental evidence given by grafting experiments where the phloem joins first and the symptoms follow the downward sap flow in certain potato diseases and mosaic diseases of other plants; and biological evidence that disease is spread by aphids sucking the phloem in certain potato diseases, and mosaic diseases of various plants. Curly top of beet is spread by leafhoppers sucking the phloem. Where infection by means of juice can be easily performed, as in tobacco and cucumber mosaics, biting insects also act as carriers.

The potato diseases of this group spread more in warmer and sheltered regions, where aphids flourish, than in colder and rougher climates.

Since the term "virus diseases" tends to cause confusion, the author prefers to call these phloem diseases. The idea that they are caused by specific microorganisms spreading in the phloem has served him as a working hypothesis for the last 10 years. Their economic importance in the light of this hypothesis, especially as regards the cultivation of potatoes, is explained either by the slowing down of the functions of the phloem or by its rôle in generalizing infection not only in plant but in clone.

A considerable degree of resemblance exists between sieve tubes and latex vessels. A number of diseases induced by protozoa, spread through latex vessels, and carried by sucking insects have already been detected.

[Plant virus diseases], T. Whitehead (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 493*).—The relative importance of different potato virus diseases has not yet been ascertained, though leaf roll, crinkle, and stipple streak are probably the most serious.

Leaf roll resulted in a loss of 55.8 and 51.8 per cent of the crop in 1921 and 1922, respectively. In some localities loss in the second year may amount to over 80 per cent. As a result of infection by leaf roll there was no appreciable reduction in tuber size, but the total number produced was reduced by 54.4 per cent. The effect on the yield was not seen during the year in which infection took place, but only in the crop grown from the infected tubers. Transmission may occur by aerial insects or through the soil by some means unknown. Rate of spread varies in same ground in different seasons; in 1921 disease spread only from plant to plant in the same row, but across the rows in 1922. The virus frequently fails to reach all tubers. Roguing, selection of healthy plants, and early digging may preserve healthy seed.

[Economic significance of virus diseases of plants], W. B. Brierley (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 493*).—"The virus group of plant diseases is an important limiting factor in the world's agriculture, and general experience indicates that the several diseases are rapidly spreading. The only statistics available are contained in the publications of the Plant Disease Survey of the United States. These date from 1918 and show that in the succeeding four years an average of 22 States lost nearly 1,000,000 tons of potatoes from mosaic disease alone. In energy values this is food for about 170,000 people during that period. From leaf roll disease the loss of potatoes in 12 States was about 500,000 tons. In an average of four States the loss of beans during 1918–1921 was approximately 850,000 tons. There is little doubt that, were statistics available for other crops and other countries, similar losses would be found to occur."

Rusts in South Africa.—I, A sketch of the life-cycle of the rust on bescm gras and wild sweet pea. II, A sketch of the life-cycle of the rust on mealie and oxalis, M. P. Evans (*Union So. Africa [Dept. Agr.], Sci. Bul. 1 (1923), pp. 14, pls. 4, figs. 13; 2 (1923), pp. 8, pls. 4, figs. 12*).—Of these two

bulletins on rusts in South Africa, the first gives a sketch of the life cycle of a rust (*Puccinia* n. sp.) on besem grass (*Tristachya rehmanni*) and on wild sweet pea (*Vigna angustifolia*). The second deals with the life cycle of the dioecious rust (*P. maydis*) on *Zea mays* and *Oxalis corniculata*.

Times for spraying with lime sulfur [trans. title], A. Beckerich (*Rev. Vitic., 61 (1924), No. 1568, pp. 38–41*).—The insecticidal and the anticryptogamic value of lime sulfur is claimed to have been fully established by experimentation fulfilling rigidly the two conditions of strict definiteness as regards composition and the particular technique which has been outlined. Three periods of application are indicated, namely, winter, summer, and after hailstorms.

[Economic plant disease studies at the Georgia Station] (*Georgia Sta. Rpt. 1924, pp. 85, 86*).—*Sclerotium rolfsii* grew best on acid media and not at all on media alkaline to phenolphthalein.

Sweet potato bed decay appears from preliminary tests to be preventable by liming the soil to slight alkalinity.

From a study of decaying peppers and seedlings, *Gloeosporium piperatum* appears capable of attacking parasitically sound pepper fruits, the other anthracnose organisms isolated acting as saprophytes or at most entering only as wound parasites. A physiological spotting of the pepper fruit blossom ends has been produced experimentally and shown to be due to irregular water supply. The spots, however, initiate injury leading to heavy losses.

Annual report of the mycologist for the year 1922, J. McDonald (*Kenya Colony Dept. Agr. Ann. Rpt. 1922, pp. 111–115*).—A browning disease of flax proved to be caused by *Polyspora lini*, and not by a Macrosporium as previously supposed. Trials of two proprietary sprays showed neither to be as cheap nor as efficient as the carbide mixture previously used as a substitute for Bordeaux mixture. The coffee berry disease occurring on the Uasin Gishu Plateau and in the Trans Nzoia district appears unlikely to prove a serious menace.

Other diseases new to this Colony or definitely identified during the year for the first time were rice blast (*Piricularia grisea*), guava fruit scab (*Glomerella psidii*), bamboo disease (*Engleromyces goetzei*), and olive disease (*Fomes yucatanensis*). A sugar cane disease resembling mosaic was shown to be different therefrom, and probably due to physiological causes.

Cereal diseases [trans. title], Schander and Crüger (*Hauptst. Pflanzenschutz Landw. Kammer Prov. Grenzmark* [etc.] *Merkbl. 3 (1923), pp.* [3]).—Of the several types of injury done to cereal crops by unfavorable conditions and by organisms including chiefly fungi but also nematodes, that due to soil acidity is here principally discussed.

[Rye and wheat rust tests at the Georgia Station] (*Georgia Sta. Rpt. 1924, pp. 66, 67, 68*).—Abruzzi rye, which was up to about 30 per cent winterkilled in 1924, showed, for the first time since the work with selfed rye started four years earlier, a heavy infestation of rust (*Puccinia dispersa*), although a considerable number of plants showed a high degree of resistance.

Considerable wheat stem rust (*P. graminis*) appeared, marked resistance being, however, apparent in a number of varieties.

Manual of vegetable-garden diseases, C. Chupp (*New York: Macmillan Co., 1925, pp. XXIV+647, figs. 155*).—The author has brought together, in nontechnical form, the more important data relating to the diseases of most of the garden vegetables grown in this country. The material is arranged alphabetically according to the host plant; the symptoms of the disease, its cause, where known, and means of control being described. For the benefit

of those who desire additional information there are given after the account of each disease references to some of the more important literature relating to it, about 2,000 citations being indicated in the work. Chapters are also given on soil sterilization and on the preparation and use of fungicides. For the benefit of plant pathologists and extension specialists the scientific names of the causal organisms are given.

A brief glossary of the technical terms used is added.

The accumulation of iron and aluminium compounds in corn plants and its probable relation to root rots, II, G. N. Hoffer and J. F. Trost (*Jour. Amer. Soc. Agron., 15 (1923), No. 8, pp. 323–331*).—Following up the account by Hoffer and Carr (E. S. R., 49, p. 327), the present paper considers only those effects upon the corn plant resulting from the absorption of aluminum and iron compounds and the probable relation of these phenomena to the susceptibility of corn plants to root rots. The details are mainly tabulated.

It is claimed that the accumulation of iron and aluminum compounds in the nodal tissues of corn plants is affected by conditions in the soil as well as by the genetical composition of the strain of corn. The accumulations of aluminum in the plants are associated with retarded growth and susceptibility of certain strains to root rots. When iron compounds gradually accumulate in the nodal tissues of the plants the growth of the stalks may be little affected, but the disintegrations of the nodal tissues are accompanied by increased susceptibilities of the plants to root rot. Of interest is the fact that when iron combines with certain organic compounds these acquire the power to bring about reductions in the presence of free oxygen. It is thought likely that some similar changes occur in the nodal tissues of the corn plants.

The maintenance of normally functioning vascular bundles is thought to be one of the important rôles of potash in the corn plant. The specific reactions occurring in the nodal tissues of the corn plants are extremely complex, and while no definite conclusions are drawn regarding these phenomena, they are thought to be in some way related to an increased susceptibility of the plants to root rots. In these experiments the organisms served as indicators of the physiological conditions of the plants resulting from changes in the nutrient relations.

Reducing corn root-rot by careful hand selection of seed, O. M. Allyn (*Jour. Amer. Soc. Agron., 15 (1923), No. 2, pp. 75–76*).—In the spring of 1922 several ears out of a stock of Western Plowman seed corn apparently free from disease were used for a test regarding the relative freedom from disease of ears grown from seed showing no disease as compared with those from seed on diseased or unselected ears. The results, as briefly presented, show that disease-free corn will produce a large, diseased seed a small, and unselected seed a medium percentage of disease-free ears in the resulting crop.

A preliminary account of the investigation of cotton wilt in Central Provinces and Berar, J. F. Dastur (*Agr. Jour. India, 19 (1924), No. 3, pp. 251–260*).—Wilt is said to be the most important cotton disease in the Central Provinces and Berar, and to be spreading. The author has isolated *Fusarium* spp. from wilted plants in various localities, but inoculation tests have usually failed, all the more completely when the plants were under normal conditions, which proved protective even to AK2 and Roseum. As yet, in fact, no conclusive evidence has been produced to prove that cotton wilt is produced by a fungus.

"The constant accumulation of the compounds of iron and aluminum in the tissues of wilting plants, the constant absence of these accumulations from the

tissues of healthy plants and plants attacked by *Rhizoctonia solani*, and the complete failure to isolate a parasitic organism from the wilting plants suggest that the accumulation of these compounds may have some correlation with the wilt, that the species of Fusarium which has been isolated from wilting plants in different cotton tracts may be merely a contributory factor in hastening the death of the plant, and that the fungus follows in the wake of the accumulations of these compounds in the tissues."

A bacterial wilt of eggplants, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 4, p. 15, pl. 1*).—A wilt of eggplant caused heavy loss at the Insular Experiment Station, and diseased specimens have been received from other parts of Porto Rico. The plants are attacked after blooming and fruiting have begun, proceeding rapidly. The progress of the disease is described. A black zone between bark and wood at the soil surface, which may be traced into roots and branches, shows an abundance of bacteria in the tracheary tubes. The diseased region gives, usually, pure cultures of the organism, which after inoculation reproduces the symptoms but not until after blooming or fruit bearing begins. Tomato, pepper, and tobacco fail to develop infection after inoculation. The organism is supposed to persist in the soil.

[**Potato seedling mosaic**], R. N. Salaman (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), pp. 493, 494*).—As regards mosaic disease and leaf roll in potato seedlings, these receive no protection from periodic nicotine spraying. Infection is only very exceptionally congenital. *Solanum nigrum*, so far as ascertained, is not a source of infection. Infection by insects appears to be insufficient explanation for the spread of mosaic and roll. Seedlings isolated in soil not hitherto used for potato culture remained during 1923 free from mosaic disease or leaf roll.

Susceptibility to mosaic is inherited, and its degree is variable, possibly the result of several genetic factors. Susceptibility to roll is also inherited apart from that to mosaic. Susceptibility is not necessarily linked with a high mortality, but lack of vigor will allow of intensification of the trouble after infection. There is a definite relation between earliness and mortality amongst seedlings.

Root diseases of the sugar beet, G. H. Coons (*Facts About Sugar, 18 (1924), No. 11, pp. 251–253*).—This paper, read before the Sugar Beet Institute held at the Michigan Agricultural College on January 23, 1924, deals with sugar beet root diseases, their causes and prevention, and causes favorable to parasites that produce damping off, the causative organisms discussed including principally *Pythium debaryanum*, *Rhizoctonia* sp., and *Phoma betae*.

Sugar beet seed disinfection with formaldehyde vapor and steam, C. Rumbold (*Facts About Sugar, 18 (1924), Nos. 14, pp. 322–324, figs. 6; 15, pp. 352–354*).—In pursuit of practical and safe methods of sterilizing externally beet balls, this work was carried on by the Office of Sugar-Plant Investigations of the Bureau of Plant Industry, U. S. D. A., for about four years. The apparatus, methods, precautions, and results are briefly set forth.

The method of treatment employed exposed dry sugar beet balls to a mixture of steam and formaldehyde at 60° C. (140° F.) for 20 minutes, impregnating the external tissues with formaldehyde so that it could be detected even after four years, the viability not being lowered during that period. The disinfected seed balls can be bagged in half an hour after treatment, which does not start germination. In field treatments on a partly commercial scale made in Colorado, the treatment was estimated to have increased the amount of sugar per acre.

[The problem of disease and other sugar cane yield factors in Louisiana] (*Facts About Sugar, 18 (1924), Nos. 19, pp. 442, 443; 20, p. 466; 21, pp. 490, 491; 22, pp. 514–516; 26, pp. 610, 611*).—Of these five serial articles on Louisiana sugar cane yield factors (among which disease, particularly mosaic, is persistently prominent), the first, by W. E. Cross, presents suggestions from Argentine experience and a consideration of cane mosaic as a factor in decreasing productivity; the second, by W. C. Stubbs, deals chiefly with drainage, cultivation, and climatic conditions as related to maximum yield; the third, by S. F. Morse, considers correct cultural methods and maintenance of soil fertility as fundamental requirements, also other factors; the fourth, by D. N. Barrow, discusses the prevailing Louisiana rotation as depleting soil resources, pointing out elements regarded as needed in fertilizers; and the fifth, by E. W. Brandes, gives data proving the effects of disease, with an account of the search for more satisfactory cane varieties.

The present position as regards mosaic in Cuba, C. A. B[ARBER] (*Internatl. Sugar Jour., 26 (1924), No. 309, pp. 469–473; trans. in Rev. Agr. Puerto Rico, 13 (1924), No. 4, pp. 265–272*).—In 1921, an attempt was made by the author to present (E. S. R., 47, p. 544) all the current aspects of sugar cane mosaic in one article. The present paper, however, is limited to such aspects as the symptoms of the disease, the effect of planting diseased cuttings, the infectious nature of the disease, the presence of a causal organism, losses, and control measures. These are treated in a somewhat general way. It is supposed that the stage in which mosaic exists in Cuba may be very different from that on some other islands, perhaps because of the rarity or absence of certain carriers.

Experimental agriculture in Jamaica: The campaign against mosaic, C. A. B[ARBER] (*Internatl. Sugar Jour., 26 (1924), No. 309, pp. 474–476*).—A careful survey and report by the superintendent of agriculture warrant the view that sugar cane mosaic has been making rapid progress in Jamaica during recent years, particularly in the extreme western and the central southern parts of the island, the infection in some cases reaching 100 per cent over large cane areas.

Uba cane appears likely to play an increasingly important part in the local sugar industry as in Porto Rico, though it is claimed by some to require longer to mature and to give poorer juice than do the local varieties. Local and varietal details are given.

Studies on carriers of the infection appear to show that interplanting sugar cane with corn very probably spreads the disease. This practice was prohibited, as was also the planting of sorghum, which was also found to be subject to mosaic.

Studies on sugar cane mosaic [trans. title], R. M. RAMOS (*Rev. Agr. Puerto Rico, 13 (1924), No. 4, pp. 219–226, figs. 2*).—From considerations presented it is regarded as evident that the infectious material of sugar cane mosaic is distributed to a considerable distance in a visibly infected cane, even into portions as yet apparently unaffected. No portion of such a cane is regarded as safe to plant. In case of secondary infection in plats reserved for the production of planting material, individual sets showing secondary infection should be at once removed and destroyed.

Experimentation with cane mosaic in Cambalache Central [trans. title], C. E. CHARDÓN (*Rev. Agr. Puerto Rico, 13 (1924), No. 4, pp. 205–218, figs. 11*).—Sugar cane matizado, or mosaic, is said to have appeared in Porto Rico during 1915, and to have invaded nearly all parts of the island by 1919. Data and discussion refer to varietal merits, principally as to resistance and sugar

Helminthosporium leaf spot of sugar cane in Porto Rico, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 4, pp. 5–10, figs. 6*).—A preliminary study of two Porto Rico sugar cane leaf spot diseases called temporarily Manati and Santa Rita, respectively, indicates that each is caused by a Helminthosporium, the organisms being of identical or closely related species or varieties. They are described for each locality, that near Santa Rita being very severe. Accounts by other authors of the same or presumably related organisms are indicated.

H. sacchari is evidently subject to great variations or more than one species exists on the island. Climatic differences may be influential in this respect. Varietal susceptibilities are indicated. These and other cane leaf spots are regarded as perhaps second in importance only to mosaic. Control may necessitate the effective selection of resistant varieties.

Lime-sulfur sprays for vineyards and orchards [trans. title], A. Beckerich (*Rev. Vitic., 60 (1924), No. 1544, pp. 89–95*).—Experiences and experimentation are briefly dealt with, in the present account, from two points of view, the first economic and technical and the second practical, lime sulfur, chiefly, being satisfactorily employed as fungicide.

[Diseased grafts], L. Rives (*Rev. Vitic., 61 (1924), No. 1566, pp. 5–9, figs. 3*).—Examination of grapevine grafts, rejected on account of discoloration, showed the presence of an intracellular mycelium and of conidia, both of which assume a brownish color. The organism is said to have been described previously as *Fusarium viticolum*, and to have been considered as a conidial form of *Nectria viticola*. It differs evidently from *F. zavianum*.

[Grape white rot], H. R. (*Rev. Vitic., 60 (1924), No. 1542, pp. 52, 53*).—A brief account is given of the grape white rot organism, *Coniothyrium diplodiella*, as regards its distribution, attack (via wounds, particularly due to hail), and control (by copper sprays 3–4 per cent, or potassium bisulfite 2.5 per cent).

Two banana diseases in Dutch East Indies [trans. title], E. Gäumann (*Ztschr. Pflanzenkrank., 33 (1923), No. 1–2, pp. 1–17, figs. 6*).—Brief discussion of related banana diseases precedes this account of Javanese vascular bundle disease and the disease (in Celebes) designated as "Blutkrankheit." From banana plants showing the vascular bundle disease, there were obtained six species of Fusarium, one of Oedocephalum, and eight of Bacterium, though one, only, of these, *Pseudomonas musae*, was shown to be truly pathogenic and a true vascular bundle parasite. Blutkrankheit appears to be due to an organism which is provisionally named *P. celebensis*.

Citrus blast and black pit caused by same bacteria (*Citrus Leaves, 1923, No. 12, pp. 1–3, figs. 4*).—Information reported by Fawcett, Horne, and Camp (E. S. R., 49, p. 650) is summarized.

Dieback of citrus trees, R. E. Lenfest (*Citrus Indus., 4 (1923), No. 12, pp. 5–7*).—This paper gives a nontechnical account of citrus die-back, including also observations on the related or included conditions ammoniation and frenching, and the factors influencing them. Die-back, said to be due to malnutrition, is distinguished from withertip and other troubles resulting in the presence of dead wood.

[Common gum diseases of California citrus fruits and their treatment] (*Citrus Leaves, 1923, No. 12 pp. 6, 7, 9, 16, 17, 18, figs. 4; 1924, No. 1, pp. 1–4, figs. 3*).—A condensation, with commentary, is given of research reported by Fawcett (E. S. R., 49, p. 650).

Coconut fall, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 4, pp. 12–14*).—In a preliminary paper the author, acknowledging assistance by R. A. Toro and J. A. B. Nolla, briefly notes a premature leaf and nut fall

affecting in places a large percentage of coconut trees. The lower trees were the more seriously attacked, though none were observed to be killed. A study of diseased nuts and litter showed a general infection with *Thielaviopsis paradoxa*, pure direct cultures being secured in a number of cases. Spraying with fungus spores from pure culture caused in a few days a very general infection and fall of nuts up to those about one-fourth grown, with easy recovery of the organism from such nuts. The moist litter furnishes ideal conditions for the fungus, which apparently sends off spores in great abundance on the wind currents, particularly from the ground litter. The disease was not found in the interior, nor at more than a few coastal points. Clean-up work was followed by practical disappearance of the disease.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The borders and beyond: Arctic, cheviot, tropic, A. CHAPMAN (*London: Gurney & Jackson, 1924, pp. XXI+489, pls. 36, figs. 168*).—Among the subjects dealt with are the British red grouse (pp. 1–44); black game (*Tetrao tetrix*) (pp. 45–54); the globe spanners, a group of "British birds" that twice each year traverse the earth (pp. 55–126); wild fowl (pp. 127–239); two British-breeding globe spanners, the curlew and the common sandpiper (pp. 250–266); salmonology, including the life history of the salmon (*Salmo salar*), etc. (pp. 267–352); the otter (*Lutra vulgaris*) (pp. 353–363); the raven (pp. 364–378); the woodcock and the heron (pp. 379–387); sea gulls (pp. 388–404); the primary senses in the animal world (pp. 405–420); the sense of smell in birds (pp. 421–439); modern zoology (pp. 440–466); and the protection of wild birds (pp. 467–475). Appendixes deal with the grouse and ptarmigan, the globe spanners, etc.

The predatory mammal problem and the balance of nature, E. A. GOLDMAN (*Jour. Mammal., 6 (1925), No. 1, pp. 28–33*).—This is a contribution from the U. S. D. A. Bureau of Biological Survey.

Food predilections of predatory and fur-bearing mammals, J. DIXON (*Jour. Mammal., 6 (1925), No. 1, pp. 34–46, pl. 1, figs. 10*).—This account is based upon studies made in California.

A laboratory manual of the anatomy of the rat, H. R. HUNT (*New York: Macmillan Co., 1924, pp. VII+123*).—This laboratory guide has been prepared by the professor of zoology at the Michigan Agricultural College.

Duration of the aestivation and hibernation of the Columbian ground squirrel (Citellus columbianus) and sex relation to the same, W. T. SHAW (*Ecology, 6 (1925), No. 1, pp. 75–81, figs. 2*).—Observations conducted at the Washington Experiment Station, extending over a period of six years, have shown that the adult male squirrels were the last to go into aestivation, and observations for four years have shown that they were the first to emerge from hibernation.

"For two seasons it was recorded that the adult males were from 2 to 6 days later in going to aestivation than the adult females, and were from 7 to 15 days earlier in returning from hibernation. The average duration of hibernation for the adult males was 204 days, and that for the adult female was 220 days, or a difference of 16 days. The longest hibernation period was that of a young female, 238 days. Dry seasons and temporary influences such as hot winds, which deprive the vegetation of moisture for the animal's food, hastened aestivation. The time for coming from hibernation was rather constant, yet cold, snow, and wet weather retarded plant growth and animal activities and resulted in the late development of young, and consequently produced a late season throughout."

An introduction to the study of birds, G. M. ALLEN (*[Boston: New England Bird Banding Assoc.], 1924, pp. 118*).—This consists of ten lectures delivered under the auspices of the New England Bird Banding Association.

Broadland birds, E. L. TURNER (*London: Country Life, Ltd., 1924, pp. XVI+172, pls. 51*).—A popular account of British birds.

Progress on cooperative quail investigation, 1924, H. L. STODDARD (*Beachton, Ga.: Quail Study Fund, 1924, pp. 22, pls. 3*).—This is a report of life history investigations conducted by the U. S. D. A. Bureau of Biological Survey in the region between Thomasville, Ga., and Tallahassee, Fla., with the principal findings of the first six months (from March 17 to September 30, 1924). The investigations show that from 60 to 75 per cent of the nests and eggs are destroyed by the numerous enemies.

On the attacks of Helix aspersa on young sycamores at the Gatty Marine Laboratory, St. Andrews, M'INTOSH (*Roy. Scot. Arbor. Soc. Trans., 38 (1924), pt. 2, pp. 111–114*).—The author reports upon the destruction of young sycamores through injury to the bark of the trunk by the snail *H. aspersa*.

Preliminary experiments in the control of slugs, W. E. H. HODSON (*Jour. Roy. Hort. Soc., 49 (1924), No. 2, pp. 191–196, fig. 1*).—This is a report of work conducted with *Agriolimax agrestis* and *Arion hortensis*, which frequently occur in sufficient abundance in Great Britain to become pests.

Of 12 insecticides tested, sodium fluoride and aluminum sulfate were selected as being worthy of further trial, both substances having a strong coagulant action on the slime. The insecticides were administered in the form of dust or a 10 per cent solution applied as a spray. Sodium fluoride had a strong scorching effect when used at concentrated strengths, and at weaker strengths may still injure delicate plants or seedlings. The addition of lime reduces the liability to scorch without impairing the efficiency of this insecticide and gives a high adhesive property. Another insecticide, sodium silicofluoride, applied as a powder proved fatal on the fourth application, while a 10 per cent solution had no effect.

An introduction to entomology, J. H. COMSTOCK (*Ithaca, N. Y.: Comstock Pub. Co., 1924, pp. XIX+1044, figs. 1228*).—The first part (pp. 1–205) of this first complete edition of the work deals with the structure and metamorphosis of insects and is the third edition of the part (E. S. R., 43, p. 850). Part 2 (pp. 207–990), dealing with the classification and the life histories of insects, is a revision of the author's Manual for the Study of Insects (E. S. R., 7, p. 147). A list of the papers, etc., referred to is included (pp. 991–1010). The author acknowledges aid from J. G. Needham in the study of wing venation, O. A. Johannsen in the preparation of the chapter on the Diptera, W. T. M. Forbes in the preparation of the chapter on the Lepidoptera, and J. C. Bradley in the preparation of the chapter on the Hymenoptera.

Manual of tree and shrub insects, E. P. FELT (*New York: Macmillan Co., 1924, pp. XXVI+382, figs. 256*).—This is a general account of the more important or common insects attacking shade and forest trees and shrubs and woody ornamentals, presented in four parts. Part 1 (pp. 1–26) consists of preliminary information on the structure, biology, and introduction of pests, with a list of references to the literature, and information on natural checks and methods of control for injurious insects. Part 2 (pp. 27–174) deals with insects attacking shade trees and ornamentals; part 3 (pp. 175–288) with forest insects; and part 4 (pp. 289–363) gives a systematic account of insects in general. Brief references to the literature follow the accounts of the insects considered.

Notes on the ratios of insect food habits, H. B. WEISS (*Biol. Soc. Wash. Proc., 38 (1925), pp. 1-4*).—This paper, supplementing earlier papers[1] (E. S. R., 51, p. 252), has been prepared for the purpose of presenting the results of various tabulations in a more comparable form.

The oviposition response of insects, C. H. RICHARDSON (*U. S. Dept. Agr. Bul. 1324 (1925), pp. 18*).—The author's discussion of the various stimuli which affect the oviposition reaction of insects is presented in connection with a list of 82 references to the literature.

It is concluded that the following internal factors may condition the oviposition responses of insects: The nutritive state as affected by the amount and chemical constitution of the food, age, fertility, and internal stimuli which determine periodic egg laying. "The external influences which may affect the oviposition response are temperature, humidity, light (including color), air currents (and probably in some species water currents), the physical character of surfaces, the chemical constitution of substances which stimulate on contact, and the volatile constituents of substances. The simplest oviposition responses are probably shown by insects which spend most of their lives upon substances that serve as food for themselves and their offpring. Most free-living insects, however, require a chain of stimuli to provoke egg laying; a single stimulus is insufficient to call forth a normal response. Many species demand a specific chain of stimuli. The odor of a substance may attract gravid female insects, but is probably never in itself sufficient to induce normal oviposition."

Annual report for calendar year 1923, D. T. FULLAWAY (*Hawaii. Forester and Agr., 21 (1924), No. 4, pp. 179-181*).—This is a brief summary of work conducted by the division of entomology of the Hawaiian Board of Agriculture and Forestry, particularly on the introduction, propagation, and distribution of beneficial insects.

Injurious insects, M. H. RUHMANN (*Brit. Columbia Dept. Agr. Bul. 68, 2. ed. (1924), pp. 58-97, figs. 23*).—This is a practical summary of information on insect and rodent enemies of cultivated plants in British Columbia. An account of Sprays and Spraying, by B. Hoy (pp. 98-109), follows.

Zoologist's report, C. WARBURTON (*Live Stock Jour. [London], 100 (1924), No. 2640, p. 448*).—This brief report, which the zoologist submitted to the Royal Agricultural Society at a meeting held November 5, 1924, deals with the occurrence of some of the important insects of the year. Sodium silico-fluoride (fluosilicate) is reported to have been very effective against slugs and cabbage caterpillars, and comparative tests of it are to be made during the coming season.

Insect pests of Labuan and adjacent islands, B. A. R. GATER (*Malayan Agr. Jour., 12 (1924), No. 11, pp. 374-376*).—The author briefly reports upon observations of economic insects while investigating the zygaenid pest of coconuts *Artona catoxantha* Hamps., which has appeared twice on Pulo Kuraman, and at the same time at Labuan and Rusukar Kechil.

The control of insect pests in New Jersey, T. J. HEADLEE (*Peninsula Hort. Soc. [Del.] Trans., 37 (1924), pp. 28-35*).—This address, delivered in November, 1923, deals with the codling moth, spray burn, and the Japanese beetle.

The status of spreaders in the poison spray solution, A. L. LOVETT (*Ent. Soc. Brit. Columbia Proc., Econ. Ser., No. 17, 19 (1923), pp. 189-194*).—This is an address presented at the annual meeting of the British Columbia Entomological Society at Vancouver, in February, 1923, by the late entomologist of the Oregon Experiment Station.

[1] Ent. News, 35 (1924), No. 10, pp. 362-364.

Mixing emulsified mineral lubricating oils with deep-well waters and lime-sulphur solutions, W. W. Yothers and J. R. Winston (*Fla. Grower, 31 (1925), No. 5, p. 6; also in Citrus Indus., 6 (1925), No. 2, pp. 6, 7*).—The fact that it is often necessary to spray for rust mites with some form of sulfur and at about the same time for white flies and scale insects with an emulsion made of lubricating oils led to the studies here reported. The experiments have shown that oil emulsions stabilized with any one of several colloidal substances, such as casein, milk, skim-milk powder, gelatin, corn meal, wheat flour, cornstarch, and laundry starch, are miscible, not only with deep-well (hard) waters but also with lime-sulfur solutions at dilutions ranging from 1–10 to 1–100, and that these substances are equal to glue for the purpose. The authors divide these materials into two classes: (1) Those which are most effective when not heated to 170° F., such as casein, gelatin, skim-milk powder, and glue, and (2) those which are most effective when heated almost to the boiling point, such as cornstarch, laundry starch, wheat flour, and corn meal. The quantities of the stabilizers required for each 3 gal. of emulsion are as follows: Glue 1 lb., skim-milk powder 1 lb., casein 8 oz., wheat flour 1 lb., cornstarch 1 lb., and laundry starch 1 lb. It is stated that more than half of the citrus groves in Florida are situated in artesian-well districts.

Nicotine soaps, L. F. Hoyt (*Indus. and Engin. Chem., 16 (1924), No. 11, pp. 1171, 1172*).—This is a report of a study made of the products formed by the union of chemically pure nicotine with purified fatty acids, as well as of the products similarly prepared from commercial grades of nicotine and fatty acids.

Effects of carbon dioxide, J. A. Willis (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 48 (1925), No. 3, pp. 209–223, figs. 5*).—This is an account of the effects of different tensions of carbon dioxide on grasshoppers.

The more important insects injurious to the sugar-beet in Utah, I. M. Hawley (*Utah Sta. Circ. 54 (1925), pp. 45, figs. 33*).—This is a practical summary of information on sugar beet insects. The insects considered that destroy the tops are the beet leafhopper, beet webworm, beet armyworm, grasshoppers, beet or spinach leaf-miner (*Pegomyia hyoscyami* Panz.), false chinch bug, flea-beetles, and blister beetles. Insects mentioned as feeding on the roots are the sugar-beet root-aphid (*Pamphigus betae* Doa.), sugar-beet root-maggot (*Tetanops aldrichi* Hendel), white grub (*Lachnosterna* sp.), and wireworms.

Insect pests of rhododendrons, G. F. Wilson (*Jour. Roy. Hort. Soc., 50 (1925), No. 1, pp. 46–54, pls. 4*).—Thirteen different species are mentioned as damaging rhododendrons.

Some habits of earwigs, B. B. Fulton (*Ann. Ent. Soc. Amer., 17 (1924), No. 4, pp. 357–367, fig. 1*).—This is a contribution from the Oregon Experiment Station. A detailed account of the insect by the author has been noted (E. S. R., 52, p. 253).

The European earwig in British Columbia, R. C. Treherne (*Ent. Soc. Brit. Columbia Proc., Econ. Ser., No. 17, 19 (1923), pp. 161–163*).—This is a brief summary of information on *Forficula auricularia* L., which was first taken alive by the author at Vancouver in September, 1916, in the hold of a steamship arriving from abroad.

Further observations on Dysdercus superstitiosus F. and other insects affecting cotton in Southern Nigeria, A. W. J. Pomeroy (*Bul. Ent. Research, 15 (1924), No. 2, pp. 173–176, pls. 4*).—In these continued experiments (E. S. R., 50, p. 755) the author has found that young bolls may be shed as a result of the mechanical action of stainer puncturing, apart from the introduction

of any specific internal boll disease. One puncture is said to be sufficient to cause the shedding.

The white fly in California, R. S. Woglum (*Calif. Citrogr., 10 (1925), No. 4, pp. 130, 131, figs. 2*).—The author emphasizes the importance of eradicating this pest from California, where it infests some 4,000 host plants in Sacramento and a similar number at Marysville, with a small infestation at Yuba City. It is estimated that the total number of hosts is not more than 10,000, which are mainly citrus.

The immunity of apple stocks from attacks of woolly aphis (Eriosoma lanigerum Hausmann), II, L. N. Staniland (*Bul. Ent. Research, 15 (1924), No. 2, pp. 157–170, figs. 18*).—In this second part of the paper previously noted (E. S. R., 49, p. 655), the causes of the relative resistance of the stocks are dealt with.

Aphides attacking vegetables and market-garden crops, F. V. Theobald (*Jour. Roy. Hort. Soc., 50 (1925), No. 1, pp. 28–45, pls. 4, figs. 8*).—This is a summary of information on the more important aphid enemies of truck crops.

Natural history of British butterflies, F. W. Frohawk (*London: Hutchinson & Co., [1924], vols. 1, pp. XV+207, pls. 36; 2, pp. [4]+206, pls. 29*).—This 2-volume folio is a complete, original, descriptive account of the life history of every species (68 in number) occurring in the British Islands (56 endemic), together with their habits, time of appearance, and localities. The several stages and work of most of the forms are each illustrated in colors on a full page plate. The work is based upon rearings from egg to adult and observations which have extended over a period of 24 years.

A new disease of the caterpillar of Pieris brassicae L. and the nucleus diseases of insects [trans. title], A. Paillot (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 23, pp. 1353–1356*).—A quite widespread disease of the larva of *P. brassicae* discovered by the author in 1917 is described. It is infectious, bodies being formed in the blood and adipose tissue cells which correspond to the polyhedral bodies of grasserie of the silkworm. An examination of the blood of an affected caterpillar, made with the ultramicroscope, shows the presence of very small granules suspended in the blood cells. These granules are animated with movements of great amplitude, and can not be distinguished from those observed in the blood of silkworms attacked by grasserie. They are clearly observed in the cytoplasm of certain cells, principally in the vacuoles resulting from the liquefaction of the cytoplasm. The granules are removed by the porcelain filter. The virulence is lessened by heating to 70° C. (158° F.) and entirely destroyed at 75°.

The author's investigations of grasserie of the silkworm, polyhedral body disease of the gipsy moth, and this disease of pierid larvae, and the observations of others on the first two and on the polyhedral body disease of the nun moth (*Lymantria* (*Psilura*) *monacha*) have led to the following conclusions: (1) That a type of infectious disease occurs in caterpillars of macrolepidoptera which is characterized by an alteration of the nucleus of certain cells, principally those of the blood and adipose tissue, for which the name "nucleus disease" is proposed, it being more inclusive than the name "polyhedral disease"; (2) that the nucleus diseases are caused by a microorganism, probably endocellular (intracytoplasmic), visible with the ultramicroscope but not stained by the ordinary methods; and (3) that the nucleus diseases are hereditary.

The etiology and epidemiology of grasserie of the silkworm [trans. title], Paillot (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 3, pp. 229–*

of the silkworm are reported upon briefly. It is due to a microbe, probably endocellular, which causes a peculiar alteration of the chromatin of the nucleus of certain cells, and is visible only with the ultramicroscope. The disease is transmissible through the injection of infected blood into the body cavity and also by ingestion. It is transmitted from one generation to another through the eggs.

The banana moth, Hieroxestis subcervinella Wkr., J. H. Durrant (*Ent. Mo. Mag., 3. ser., 11 (1925), No. 121, p. 12*).—The author gives the synonymy of this moth, which is a serious pest of bananas in the Canary Islands and has been reported as injurious to sugar cane in Mauritius and also as attacking potatoes and other stored tubers.

On the life history and the poison apparatus of the white flannel moth, Lagoa crispata Packard, W. J. Baerg (*Ann. Ent. Soc. Amer., 17 (1924), No. 4, pp. 403–415, figs. 15*).—The author presents an account of the life history of this moth in Arkansas and of its poison apparatus.

Sodium fluoride and cutworms (*Union of So. Africa Dept. Agr. Jour., 9 (1924), No. 5, pp. 458–460*).—Experimental work by L. B. Ripley has led to the preparation of a bait containing sodium fluoride which has several important advantages over other baits used against cutworms.

The peach twig borer (Anarsia lineatella) in British Columbia, R. C. Treherne (*Ent. Soc. Brit. Columbia Proc., Econ. Ser., No. 17, 19 (1923), pp. 176–183*).—A brief account of this insect and its control in British Columbia.

The European corn borer in America, G. A. Dean (*Jour. Wash. Acad. Sci., 15 (1925), No. 3, p. 61*).—This is an abstract of an illustrated address by the author delivered in November, 1924.

The importance of winter mortality in the natural control of the European corn borer in New England, G. W. Barber (*Psyche, 31 (1924), No. 6, pp. 279–292, fig. 1*).—This is a report of investigations conducted with a view to determining the importance of winter mortality in the natural control of this corn borer in New England. Examinations made of several host plants have shown the mortality to be highest in pigweed and barnyard grass, averaging 21 per cent in pigweed in 1922 and 14 per cent in 1923, and 10.9 per cent in barnyard grass in 1922 and 9.6 per cent in 1923. The average mortality in all host plants was 9.4 per cent in 1922 and 8.3 per cent in 1923. The author concludes that from a study of winter weather of 15 localities representing the entire infested area no one factor alone is responsible for winter mortality, the extent of mortality seeming to be associated with winter severity.

Control of the cranberry girdler by submerging in water, C. S. Beckwith (*New Jersey Stas. Bul. 411 (1925), pp. 14, fig. 1*).—This is a report of control work with the cranberry girdler in New Jersey, a brief account of which has been noted (E. S. R., 52, p. 751). The author found that infestations of this girdler were located easily when the insect was in the adult stage. Attempts to control the insect by killing the adults have been unsuccessful. As previously pointed out, flooding the infested bog during the larval period floated the larvae, which came to the surface in less than 12 hours and were destroyed, probably by birds. Flooding during early August proved to be a very efficient control measure when used on an extensive area. The rot of the fruit following August flooding was reduced by applying a Bordeaux spray just before and just after the flooding.

Two minor pests from Europe (Lepidoptera, Plutellidae), W. T. M. Forbes (*Jour. N. Y. Ent. Soc., 32 (1924), No. 4, p. 178*).—The author records

the collection at Ithaca, N. Y., of the European pine leaf-miner (*Ocnerostoma piniariella* Z.) and the honeysuckle leaf roller (*Cerostoma xylostella* L.).

Ravages caused by the Golonbatz fly in Roumania: Its attacks on animals and man, T. Ciurea and G. Dinulescu (*Vet. Jour., 81 (1925), No. 596, pp. 74–81, figs. 4*).—This is an account of attacks of *Simulium columbaczense* Schiner in Rumania.

Thereva plebeia L. as a pest of economic importance, G. F. Wilson (*Jour. Roy. Hort. Soc., 49 (1924), No. 2, pp. 197–202, pls. 2*).—The author reports that field and pot experiments have conclusively shown that the larvae of this dipteran, known locally in England as the white wireworm, may feed upon living plants if the soil has a low humus content, and become a source of injury. Thereva larvae have been recorded as injuring garden vegetables in Kent and Hampshire, cabbage plants and potato tubers at Wisley, and rye in Silesia and Pomerania.

A new tachinid parasite of a cocoanut moth in south Asia (Diptera), J. M. Aldrich (*Ent. Soc. Wash. Proc., 27 (1925), No. 1, p. 13*).—A tachinid reared in large numbers from the larvae of the zygaenid moth *Artona catoxantha* Hamps., a very injurious enemy of the coconut in the Federated Malay States, is described as *Ptychomyia remota* n. sp.

Mediterranean fruit fly (Ceratitis capitata), J. M. Ward (*Jour. Dept. Agr. Victoria, 22 (1924), No. 7, pp. 427–433*).—The author records the appearance of this pest in Victoria in December, 1923, some 18 years after a previous outbreak that was eradicated. In January and February, 1924, it was present in 120 orchards in the Mildura district and in March was discovered in the Goulburn Valley. The fact that the Queensland fruit-fly (*Chaetodacus tryoni*) has not been killed in the pupal stage by heavy frost and snow in the Stanthorpe district, Queensland, has led the author to conclude that the Mediterranean fruit-fly will also survive. The effect of cold storage temperatures upon apples infested with the Queensland fruit-fly, conducted by H. Tryon in 1923, is reported upon in tabular form. Methods of eradication are discussed.

Guide to the study of tsetse flies, R. Newstead et al. (*Liverpool School Trop. Med. Mem., n. ser., No. 1 (1924), pp. XI+332, pls. 32, figs. 58*).—Following a preface and introduction, this work deals with the reproduction and life cycle of tsetse flies (pp. 4–19), the digestive or alimentary tract (pp. 20–22), generic and general characters (pp. 23–36), general characters of the male and female genital armature (pp. 37–42), classification and group characters of tsetse flies (pp. 43–45), synopsis of the species (pp. 46–235), and technique (pp. 236–240). A bibliography of 16 pages and a general index are included.

Lantana flies (Agromyza lantanae Frogg.) in Hawaii, K. Kunhi Kannan (*Agr. Jour. India, 19 (1924), No. 5, pp. 504–508*).—An investigation conducted by the author has led to the conclusion that *A. lantanae* has proved distinctly beneficial, not only in the islands of Hawaii and Fiji but also on the continent of Australia, where in both Queensland and New South Wales it has helped materially to keep lantana in check. Other insects that supplement the work of the lantana fly in Hawaii include the lantana tortricid, lantana plume-moth, leaf bug (*Teleonemia subfasciata*), and the gall fly (*Eutrita xanthochaeta*), the tortricid caterpillar being the most effective, even more so than the lantana fly. A shipment of *A. lantanae* resulted in the liberation of some 273 flies in Bangalore, recoveries from which have not as yet been made.

A means of catching the fruit nibbler (Odontionopa sericea Gyll.), C. W. Mally (*Union So. Africa Dept. Agr. Jour., 9 (1924), No. 4, pp. 301–305, figs. 3*).—Remedial measures are considered, and a mechanical means for trapping this beetle, which is responsible for scars on the fruit, is described.

A new cotton pest (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 1, p. 11*).—A leaf and stem feeding beetle, *Syagrus rugifrons* Baly., known for several years as an occasional pest of cotton in South and East Africa, is said to have caused considerable damage to cotton on several farms in the District of Vryheid and in Zululand, Natal. The adults feed on the leaves, and the grubs gnaw the underground stem and roots of the plant.

The comparative value of carbon bisulfide and other organic compounds as soil insecticides for the control of the Japanese beetle (Popillia japonica Newm.), W. E. FLEMING (*New Jersey Stas. Bul. 410 (1925), pp. 3-29*).—This is a report of investigations conducted cooperatively by the U. S. D. A. Bureau of Entomology and the New Jersey, Pennsylvania, and Delaware State Departments of Agriculture, at the Japanese Beetle Laboratory, in continuation of those by Lesch and his associates, previously noted (E. S. R., 46, p. 251; 49, p. 657; 50, p. 56; 51, pp. 58, 763).

The data, the details of which are presented in tabular form, deal with many compounds which were tested and evaluated. They were grouped according to the minimum weights necessary to produce a larvicidal vapor in a closed chamber at 26.7° C. (80° F.) "An attempt was made to correlate the physiological action of a compound with its physical properties or its chemical constitution and thus expedite the selection of the insecticide, but so many variable factors intruded that no clear conclusion could be drawn. As a result of their ability to evolve toxic vapors, the following compounds were selected for further tests: Benzyl chloride, phenol, o-cresol, naphthalene, nicotine, *o*-toluidine, *p*-dichlorobenzene, sodium cyanide, nitrobenzene, aniline, o-nitrotoluene, hexachloroethane, bromobenzene, carbon disulfide, *m*-cymene, and chlorobenzene.

"Each of these compounds producing the most toxic vapors was dispersed in water and tested for its larvicidal action as a contact insecticide. A preliminary experiment having shown that third instar larvae survived submerging in water for over 15 days, the larvae were removed from soil and dipped into different concentrations of these compounds until the minimum amount lethal at 26.7° was determined. The following results were obtained: High toxicity—benzyl chloride, naphthalene, sodium cyanide, hexachloroethane, carbon disulfide; medium toxicity—bromobenzene, *p*-dichlorobenzene, chlorobenzene, o-nitrobenzene, phenol, and o-cresol; and low toxicity—*o*-toluidine, aniline, and *m*-cymene.

"Since the different stages of the insect are found in the soil throughout the year, the effectiveness of each compound was tried against each stage with the following results: Toxic to all stages—benzyl chloride, carbon disulfide, bromobenzene, hexachloroethane, *p*-dichlorobenzene, chlorobenzene, nitrobenzene, and *o*-nitrotolnene; nontoxic to eggs—sodium cyanide and naphthalene; and larvicides—*o*-cresol and phenol.

"Using the penetration of insecticidal dosages of the compounds into mixtures of sand and peat as an index of their value in soil, the following results were obtained: High toxicity in sand—naphthalene, sodium cyanide, *o*-cresol, phenol, hexachloroethane, *p*-dichlorobenzene, carbon disulfide, chlorobenzene, nitrobenzene, *o*-nitrotoluene, *o*-toluidine [the last seven of which were toxic to all stages of the Japanese beetle]; and high toxicity in sand and peat mixtures—naphthalene, sodium cyanide, *o*-cresol, phenol, hexachloroethane, p-dichlorobenzene, carbon disulfide, bromobenzene [the last four of which were toxic to all stages of the Japanese beetle].

"Using scarlet sage, pot marigold, pine, and juniper as an index of the effect on plants of pouring solutions of the toxic compounds about their roots, it was found that carbon disulfide and naphthalene were the only compounds of those

tried that could be used with safety to destroy the infestation in the soil about the roots of growing plants."

The author has been led to the general conclusion that carbon disulfide, emulsified in water and so interspersed throughout the soil, is the compound best adapted, of those studied, for freeing the soil about the roots of nursery stock of possible infestation by the Japanese beetle.

A list of 75 references to the literature is included.

Life history and habits of two Pacific coast bark beetles, F. M. TRIMBLE (*Ann. Ent. Soc. Amer., 17 (1924), No. 4, pp. 382–391, figs. 8*).—This account relates to two species of bark beetles which have been doing considerable injury to Monterey pine along the central part of the California coast region, namely, *Ips plastographus* Lec. and *I. radiatae* Hop.

The Bostrichidae of French tropical Africa, P. LESNE (*Les Coléoptères Bostrychides de l'Afrique Tropicale Française. Paris: Presses Univ. de France, 1924, pp. 301, pl. 1, figs. 210*).—A synopsis of this wood-boring family of beetles in French tropical Africa.

Shot-hole borers of Hevea [trans. title], L. G. E. KALSHOVEN (*Arch. Rubbercult. Nederland. Indië, 8 (1924), No. 6, pp. 355–365*).—This is a report of studies of the shot-hole borers infesting Hevea in the Dutch East Indies, a summary of which is presented in English.

The lime tree borer (Chelidonium cinctum), K. KUNHI KANNAN (*Mysore Agr. Calendar, 1924, pp. 16, 17, 20, pl. 1, fig. 1*).—This is a brief account of a serious cerambycid beetle enemy of lime and other citrus trees in Mysore.

Observations on Baris spp. and their parasites [trans. title], J. C. FAURE (*Min. Agr.* [*France*], *Ann. Épiphyties, 9 (1923), No. 2, pp. 109–120, figs. 4*).—The studies here reported were conducted in connection with those previously noted (E. S. R., 50, p. 851). A brief account of the biology of curculionids of this genus occurring in France, first presented, is followed by an extended report of studies of the parasite *Bracon variator* Nees. Other hymenopterous parasites, briefly considered, include *B. baridii* Marsh., *B. glaphyrus* Marsh., *Entedon pharnus* Wlk., *Eurytoma curculionum* Mayr., and *Pteromalus* sp. A list is given of 20 references to the literature.

"Red stripe" weevil of coconuts (Rhynchophorus schach Oliv.), G. H. CORBETT and D. PONNIAH (*Fed. Malay States Dept. Agr. Bul. 36 (1924), pp. 51, pls. 6*).—This is a report of biological studies of *R. schach*, which the author believes to be of specific rank rather than a variety of *R. ferrugineus*.

Beekeeping for beginners, H. GARMAN (*Kentucky Sta. Circ. 35 (1925), pp. 3–34, figs. 11*).—This is a practical account of beekeeping, prepared particularly for the beginner.

Brood rearing, J. H. MERRILL (*Bee World, 6 (1924), No. 7, pp. 102, 103*).—This is a contribution from the Kansas Experiment Station, where brood-rearing studies have been conducted during a period of five years. Several colonies of bees were used each year, and brood counts were made at intervals of 3, 6, 9, and 21 days.

Spread of American foul brood, S. B. FRACKER (*Gleanings Bee Cult., 52 (1924), No. 8, pp. 507–509, figs. 2*).—In reporting upon the spread of this disease in Wisconsin, the author states that commercial honey shipments have had a very small part, and that the movements of bees and used bee supplies are responsible for 90 and perhaps 99 per cent of the spread. The introduction of the disease into Wisconsin is said to have taken place in 1870 with bees from Italy.

Sodium hypochlorite treatment, H. F. WILSON (*Gleanings Bee Cult., 52 (1924), No. 10, pp. 648, 649*).—Field and laboratory work in Wisconsin with

sodium hypochlorite in the form of Be-Helth have shown it to kill free spores of *Bacillus larvae* in five minutes.

"Hive bodies and frames of foundation infected with spores of *B. larvae*, dried and sprayed with Be-Helth, did not transmit the disease to a healthy colony. Be-Helth kills the spores of *B. larvae* in the dried scale in 48 hours when the scale is immersed in the solution. Healthy colonies fed the solution resulting from the action of Be-Helth on scales, in sugar sirup, did not develop the disease. One part of Be-Helth in eight parts of contaminated honey-water sirup killed the spores of *B. larvae* in 48 hours. Healthy colonies fed this solution did not develop the disease."

New chalcidoid (hymenopterous) parasites and hyperparasites of the black scale, Saissetia oleae Bernard, H. Compere (*Calif. Univ. Pubs. Ent., 3 (1925), No. 3, pp. 295–314, pls. 7*).—The author presents descriptions of five new chalcidoid parasites. The following species, listed in the order of their importance, have been reared experimentally on the larvae or pupae of *Aphycus lounsburyi* How., a primary parasite which is of considerable importance as an enemy of the black scale: *Quaylea whittieri* (Gir.), *Eusemion californicum* n. sp., *Tetrastichus blepyri* Ashm., *Cheiloneurus inimicus* n. sp., *C. lineascapus* Gah., *Eupelmus inyoensis* Gir., and *Thysanus niger* (Ashm.).

The life-history of Aphidius avenae (Hal.), a braconid parasitic on the nettle aphis (Macrosiphum urticae), E. I. MacGill (*Roy. Soc. Edinb. Proc., 43 (1922–23), No. 1, pp. 51–71, figs. 13*).—An account of the anatomy, life history, and habits of a braconid which in early April parasitized as high as 83 per cent of the nettle aphid at Haughton Green, Lancashire. A list of 29 references to the literature is included.

The relation of the predatory mite "Hemisarcoptes malus" Shimer to the oyster-shell scale in British Columbia, E. P. Venables (*Ent. Soc. Brit. Columbia Proc., Econ. Ser., No. 17, 19 (1923), pp. 164–167*).—The author reports that mites were found beneath 22 of 119 scales examined at Vernon, B. C., in May, 1921, six individuals being the largest number found beneath a single scale.

A successful experiment in the eradication of acarine disease, C. T. Sanctuary (*Bee World, 6 (1924), No. 6, pp. 91, 92*).—The author describes a manipulative treatment which he has used with success in eradicating *Acarapis woodi* Ren.

The external morphology and bionomics of the commonest Indian tick (Hyalomma aegyptium), M. Sharif (*Agr. Research Inst., Pusa, Bul. 152 (1924), pp. 23, pls. 5*).—This is a report of studies of the tick occurring most commonly in India.

FOODS—HUMAN NUTRITION

Selected list of Government publications on foods and nutrition, compiled by R. Van Deman (*U. S. Dept. Agr., Bur. Home Econ., 1925, rev., pp. 36*).—This is a revision of the list previously noted (E. S. R., 51, p. 196).

Report of the Food Investigation Board for the year 1923, W. B. Hardy et al. (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1923, pp. IV+77, pls. 18, figs. 8*).—This annual report of the Food Investigation Board of Great Britain (E. S. R., 51, p. 459) contains in addition to the usual committee reports a brief description of an expedition sent to Australia to study the conditions of apple transportation, and a special section on the theory of freezing as applied particularly to the cold storage of beef and eggs. A special report by Stiles on the preservation of food by freez-

ing has been noted previously (E. S. R., 49, p. 559). The essential points concerning the freezing of eggs are summarized as follows:

"Eggs can be over-cooled readily. When this is avoided their true freezing point, which undoubtedly varies slightly with different eggs, lies between −0.45 and −0.65° C. [31.19 and 30.83° F.]. At any temperature below this eggs can be frozen to the point at which they become sufficiently solid to permit of their being sawn through. If the temperature of the egg at no time falls below −6° [21.2 F.] the contents recover their fluidity on thawing. If the temperature falls below −6° both the yolk and white are permanently changed, the former having a thick, pasty consistency when thawed."

Hydrogen ion concentration in bread-making, S. P. L. Sorensen (*Amer. Food Jour., 19 (1924), No. 12, pp. 556–560, figs. 8*).—In this address, delivered before the American Bakers' Association, the author discusses the importance of the H-ion concentration of the dough in relation to the enzymes of flour and yeast and to the physicochemical condition of the proteins of the flour.

The size of the pores in baked bread, K. Mohs (*Cereal Chem., 1 (1924), No. 3, pp. 149–151, pls. 3*).—As a means of illustrating the distribution, uniformity, and size of the grain cells in bread in judging its quality, the author has substituted for the usual photographs the impression made upon unsized paper by covering a section of the bread with a paste of lampblack and oil and pressing it firmly against the paper. Reproductions are given of 10 such impressions made from loaves showing gradations in size of pores from very large to minute. These constitute a numbered scale which can be used for reference in describing the cellular structure of any particular sample of bread.

The six cardinal points, J. P. Bryant (*Northwest. Miller, 141 (1925), No. 4, pp. 325, 326, 346, 347*).—The six cardinal points discussed in this paper, which is written by a baker, are the factors considered to be most important in judging bread quality. They are flavor, texture, moisture, bloom, volume, and general appearance.

Amino acid synthesis in the animal organism.—The availability of some caproic acid derivatives for the synthesis of lysine, D. A. McGinty, H. B. Lewis, and C. S. Marvel (*Jour. Biol. Chem., 62 (1924), No. 1, pp. 75–92, figs. 6*).—To determine whether lysine, which is known to be essential for growth, can be synthesized in the body from some of its derivatives, certain amino and hydroxy derivatives of caproic acid closely related to lysine were used as the sole source of this amino acid in feeding experiments with young rats.

None of the derivatives studied, which included α-hydroxy, ε-hydroxy, ε-amino, and α-hydroxy-ε-aminocaproic acids, proved capable of supplementing the gliadin which served as the sole protein of the diet. Good growth was secured on gliadin supplemented with lysine and with the inactive *dl*-lysine. These results are thought to indicate that, at least under the experimental conditions employed, α-hydroxy acids can not be converted by the animal organisms into α-amino acids.

Calcium metabolism, the content of calcium in the blood, and the action of calcium [trans. title], W. H. Jansen (*Klin. Wchnschr., 3 (1924), No. 17, pp. 715–719*).—The results of a long-continued calcium metabolism study on a human subject are reported and discussed. The particular object of the investigation was to determine the relationship existing between the level of calcium in the blood and the extent of its resorption after its ingestion; the relative resorption of calcium after the ingestion of various calcium salts, calcium-rich mineral waters, and calcium-rich foods; and the relation between the extent of calcium resorption, the content of the calcium in the blood, and its

pharmacological or therapeutic action. The metabolism studies were conducted for a period of about 4 months on a single subject who subsisted for about a month on a calcium-low diet (0.008 gm. CaO per kilogram of body weight). On this diet the output of calcium as CaO was 0.113 gm. daily in the urine and 0.4 gm. in the feces, a ratio of 28:72 per cent. In 15 determinations of the blood calcium during this period the values ranged from 7 to 7.84 mg. per 100 cc., with an average of 7.42 mg. After this preliminary period, additions to the diet of various compounds of calcium, furnishing in most cases 1.7 gm. of CaO per day, were made for 5-day periods with each substance. These included calcium phosphate, chloride, lactate, bicarbonate, sulfate, acetate, and bromide, two mineral waters, and milk. Calcium determinations were made on the urine daily, on the feces for the whole period, and on the blood at varying intervals.

As shown by the tabulated results of these metabolism studies, the calcium content of the urine ranged from 0.15 gm. CaO daily (calcium phosphate, one of the mineral waters, and milk) to 0.29 gm. daily (calcium bicarbonate). The calcium content of the feces ranged from 0.9 (calcium bicarbonate) to 1.9 gm. (calcium phosphate). The proportion of calcium excreted in the feces as compared with the urine was thus markedly increased. The calcium content of the blood showed no increase in the case of calcium lactate, but with the other substances an increase varying from 7.6 per cent in the case of one of the mineral waters to 55.2 per cent in the case of calcium bicarbonate. The increase in blood calcium was proportional to the resorbed calcium which later appeared in the urine. The maximum increase took place in the first 2 or 3 hours and was followed by a decrease to the former level or even lower.

The relative resorption of the various salts was in increasing order phosphate, sulfate, chloride, bromate, and bicarbonate. This appeared to be dependent upon the relative dissociation of the salts, the combination of organic and inorganic ions, and the presence of other ions.

To answer the third question, calcium salts were injected intravenously into human subjects and also into cats, and observations were made of the effect upon respiration and pulse rate during the brief period of increased concentration of calcium in the blood. Both were found to be lower during this period.

Further experiments on the influence of the parents' diet upon the young, I, II, V. Korenchevsky and M. Carr (*Biochem. Jour., 18 (1924), No. 6, pp. 1308–1318*).—In continuation of an investigation previously noted (E. S. R., 50, p. 667), two papers are presented.

I. *The influence of the father's diet.*—In this study the female rats were fed a normal diet during the whole of pregnancy and a diet deficient in fat-soluble vitamins during lactation. The males were fed a normal diet until 2 weeks before copulation, when half were continued on this diet and the rest fed the same vitamin A-deficient diet as was fed the females during lactation. In all, 36 females and 14 males were used. In the control group there were 24 matings and in the other 34. The general results of the experiment were as follows:

No pregnancy occured in 4.2 per cent of the normal control group and in 23.2 per cent of the group in which the males were on the deficient diet. Of the litters born, the percentages eaten in the two groups were 13 and 42.8 per cent and the deaths from other causes 13.3 and 18.6 per cent, respectively. The average weights of the young at weaning were 31 and 31 gm. for the males and 29 and 30 for the females, and at 65 days 62 and 61 and 51 and 55

gm., respectively. No appreciable differences were found in the calcium content of the skeletons of the young of the two groups.

These results would seem to indicate that if the diet of the males before copulation is deficient in fat-soluble vitamins, there will be a greater percentage of sterility and the offspring will be weaker than if the males were on a normal diet.

II. *The influence upon the young of an excessive amount of fat-soluble factor and calcium in the mother's diet during pregnancy.*—Previous experiments on the influence upon the young of the fat-soluble vitamins in the mother's diet during pregnancy were repeated, and a similar study was made of the effect of an excessive amount of calcium in the mother's diet during pregnancy. Five pairs of rats were used in the first study. The males before mating and the females before and during pregnancy were fed a diet containing ample cod liver oil and butter. The females during lactation and the young after weaning were fed a diet deficient in fat-soluble vitamins. Data were obtained on the growth of the young and the calcium and water content of the bones of some of the young at 24 and others at 65 days of age and these figures compared with similar data from previous studies with other diets. In the second part of the study two pairs of rats were used and the diet differed from that of the preceding study only in that the amount of calcium was trebled. The conclusions drawn are summarized as follows:

"When the mother's 'normal' diet during pregnancy is enriched with an excess of the fat-soluble factor there is a marked decrease in the disorders of general nutrition and in the rachitic changes in the skeleton produced in the young by a diet deficient in fat-soluble factor, even when the mother is also kept on the same insufficient diet during lactation. This effect is not produced by giving an excess of calcium during pregnancy, provided that the mother's 'normal' diet already contains an adequate amount of calcium. Therefore, in order to decrease the above-mentioned disorders in the young, an excessive amount of fat-soluble factor and not of calcium is of great importance in the diet of the mother during pregnancy. At the same time the importance of an adequate amount of calcium in the mother's diet is emphasized."

In an added note reference is made to the paper by Hess and Weinstock previously noted (E. S. R., 52, p. 365). The less pronounced results obtained by these authors are attributed partly to the fact that the diet they employed was deficient in phosphorus, as well as in antirachitic vitamin, and partly to the fact that no chemical analyses were made of the experimental animals and that differences which were probably present were not brought out.

The theoretical food requirements of infants, G. B. Fleming (*Brit. Med. Jour., No. 3337 (1924), pp. 1093, 1094, figs. 2*).—This discussion is based upon data obtained in observations by the author and by Benedict and Talbot on the basal food requirements of children in all stages of nutrition from 20 per cent above normal weight to 70 per cent below normal (E. S. R., 45, p. 561). In estimating the food requirements consideration has been taken of the amount lost in the excreta, the amount added to the body in growth, and the amount used in muscular exercise.

The basal requirement for normal children under one year of age is estimated to be 55 calories per kilogram of the expected weight, and for emaciated children 50 per cent or more below normal weight about 40 calories per kilogram of the expected weight. The amount of food lost in the excreta when the diet is adjusted to the expected weight is considered to be considerably

20 per cent of the basal requirements. Allowing 5 calories per kilogram daily for growth in normal infants, it is considered that 10 calories per kilogram should be added for infants 70 per cent below normal. For muscular exertion the estimated requirement is 35 calories for normal and 20 for emaciated infants. The final suggestion made is that during the first year of life infants weighing within 30 per cent of the expected weight for age should receive a diet furnishing 100 calories per kilogram of the expected weight per day, and that below this weight diets of gradually decreasing calorie value should be given.

The effect of irradiation of the environment with ultra-violet light upon the growth and calcification of rats fed on a diet deficient in fat-soluble vitamins—The part played by irradiated sawdust, E. M. Hume and H. H. Smith (*Biochem. Jour., 18 (1924), No. 6, pp. 1334–1345, figs. 3*).—The conclusion drawn in a previous paper (E. S. R., 50, p. 265) that irradiated air has growth-promoting and antirachitic properties has been shown to be unjustified. The favorable effect attributed to the air has been traced to the sawdust present in the jars irradiated. No explanation is given of this phenomenon.

Note upon the effect on the growth of rats receiving a diet deficient in fat-soluble vitamins, of exposing their environment to the emanation from radium bromide, H. Chick and M. Tazelaar (*Biochem. Jour., 18 (1924), No. 6, pp. 1346–1348*).—The suggestion made by Hume and Smith in the earlier paper referred to above, that ionized air may have a stimulating effect upon the growth of young rats on diets deficient in fat-soluble vitamins, has been examined but with negative results. The growth of young rats in glass jars which were exposed when empty for 10 minutes daily to the emanation of radium bromide did not differ appreciably from that of rats of the same litters kept in untreated jars.

Fat-soluble vitamins.—XXI, Observations bearing on the alleged induction of growth-promoting properties in air by irradiation with ultra-violet light, E. M. Nelson and H. Steenbock (*Jour. Biol. Chem., 62 (1925), No. 3, pp. 575–593, figs. 12*).—The conclusions of Hume and Smith, reported in the paper noted above, were also reached in this continuation of the series of studies previously noted (E. S. R., 52, p. 804).

In attempting to explain the results obtained by Hume and Smith the idea occurred to the present authors that the possible rôle of the sawdust had been overlooked. To investigate this possibility the experiments were repeated, except that instead of sawdust the rats were kept on screens. In a preliminary experiment, 2 rats were irradiated on screens in the jars, 2 were kept in jars containing screens which had previously been irradiated, and 2 were kept on nonirradiated screens in jars previously irradiated. In all cases the jars were cleaned and the food and water removed before irradiation, and except in the case of direct irradiation of the rats the air was blown out of the jar. Growth resulted in the first and second groups but not in the third, showing that irradiation of the screen had the same effect as direct radiation of the animals.

The preliminary experiment was followed by a long series of experiments undertaken to explain the action of the irradiated screens. It was found that copper could be irradiated as well as zinc, that the induced action was not an electrical effect, that irradiation of granulated zinc and zinc screening in quartz and Jena flasks kept in the cages was without effect, that new screens were without effect after irradiation, and that irradiated screens placed above the animals and irradiated washed screens were without effect. The conclusions drawn from growth curves were substantiated by bone analyses of some of the animals.

The various results obtained have led to the conclusion that slight contamination of the screen is responsible for the effect on subsequent irradiation. "We do not as yet know the mechanism whereby the animal is directly affected, but we believe that the animal is directly stimulated by the consumption of small amounts of the activated contamination found on the screens."

Growth and maintenance in the rat on an artificial diet deprived of vitamin B and carbohydrates [trans. title], L. RANDOIN and H. SIMONNET (*Compt. Rend. Acad. Sci.* [*Paris*], *179* (*1924*), *No. 21, pp. 1219–1222, fig. 1*).—The feeding experiments with pigeons previously noted (E. S. R., 52, p. 863) have been repeated with rats with similar results.

With adult rats maintenance of weight was secured with all the rations except the one containing carbohydrate but no vitamin B. With young rats on the same rations there was normal growth on the artificial complete ration, normal growth at first followed by loss in weight and death in about 40 days on the ration supposedly complete except for vitamin B, regular growth at first and then maintenance at a weight below normal on the ration containing vitamin B with no carbohydrate, and the same results on the ration containing no carbohydrate and no vitamin B.

The author concludes that rations containing carbohydrates must be provided with a quantity of vitamin B proportional to the quantity of carbohydrate present, but that if carbohydrates are absent death does not follow for at least six months in the case of the rat.

A preliminary note on the growth-promoting and anti-rachitic value of cod liver oil when injected intraperitoneally, K. M. SOAMES (*Biochem. Jour.*, *18* (*1924*), *No. 6, pp. 1349–1353, fig. 1*).—The conflicting literature on the availability of fat-soluble vitamins when administered by injection instead of ingestion is reviewed, and preliminary experiments are reported which show that cod liver oil when injected intraperitoneally affords partial protection against a rickets-producing diet and improves growth and calcification on a diet deficient in vitamin A. Much of the oil was unabsorbed, which may account for the incompleteness of the protection. A sufficient difference between the treated and untreated animals was noted to show that a definite action had taken place, and that consequently the site of action of cod liver oil is now limited to the intestinal tract.

Experimental studies on the vitamin content of milk [trans. title], L. F. MEYER and E. NASSAU (*Klin. Wchnschr.*, *3* (*1924*), *No. 47, pp. 2132–2135, figs. 6*).—An investigation into the cause of the large number of cases of infantile scurvy in Berlin since the war showed the ordinary market milk and the special children's milk to be very deficient in vitamin C as compared with 24-hour-old raw cow's milk. The ordinary market milk of the city is said to be not only pasteurized but frequently to be treated with hydrogen peroxide, while the special children's milk is treated by the biorization process, consisting in heating the milk to 72° C. in a fine spray.

Growth curves of guinea pigs on the different forms of milk as the sole source of vitamin C are reproduced, together with one on raw fresh goat's milk. This curve indicates a lower content of vitamin C in fresh goat's milk than in fresh cow's milk. This is suggested as a partial explanation of the so-called goat's milk anemia observed in children fed on this milk.

An experimental study of brown and white bread in the diet of the rat, G. A. HARTWELL (*Biochem. Jour.*, *18* (*1924*), *No. 6, pp. 1323–1328, fig. 1*).—In this comparison of the nutritive value of brown and white bread, the criteria

bread, butter, and salt mixture and the efficiency of these diets for gestation and lactation. The white bread used was of the same composition as that used in previous studies (E. S. R., 51, p. 567), and the brown bread was made from pure wheat meal from which a portion of the endosperm but not the germ had been removed. Two groups of 12 rats each, 6 males and 6 females, were used.

The rate of growth of the young rats was slow on both diets. The males grew more rapidly on the brown bread than on the white and the females at about the same rate on both. Both sets bore litters, but the young were small and only a few were weaned. No appreciable difference could be noted between the two groups in this respect. In additional series of experiments in which the animals were not put on the bread diet until the young were born or until the animals were old enough to breed, better results were obtained but with no marked difference between the brown and the white bread.

Bread substitutes in diabetic diets, R. Rockwood (*Minn. Med., 8 (1925), No. 2, pp. 113–115, fig. 1*).—The author calls attention to the necessity in prescribing diabetic diets of emphasizing not so much the kind of food that the patient may eat as the amount. As an illustration of erroneous ideas concerning bread substitutes, a list of such substitutes recommended by various physicians is given, with the relative amounts of sugar produced in the body by equal amounts of these substitutes. As graphically represented by the number of 5-gm. lumps of sugar corresponding to 100 gm. of the various breads, there was shown to be only slight differences between corn bread, gluten bread, whole wheat bread, brown bread, rye bread, white bread, and toast. Tables are also given on the sugar value and composition of various gluten flours and gluten breads.

The new method in diabetes, J. H. Kellogg (*Battle Creek, Mich.: Mod. Med. Pub. Co., 1924, 3. ed., rev., pp. 300, pls. 8, fig. 1*).—A new feature of the third edition of this manual on diabetes is the inclusion of a ration table and a diabetic diet table. The table of rations contains the proportions of fats, carbohydrates, and calories for varying amounts of protein balanced for sugar tolerance and acidosis. The diet table contains an extensive list of balanced bills of fare and on the reverse side of the sheet a list of foods grouped according to content of carbohydrates; another list of foods showing the quantities of each furnishing 5 gm. of carbohydrates; tables of the food requirement in calories of boys and girls from 8 to 17 years of age and for men from 60 to 75 in. in height and women from 59 to 70 in. in height; and a table of the number of calories required for basal metabolism according to height and weight.

Endocrine diseases, including their diagnosis and treatment, W. Falta, trans. and edited by M. K. Meyers (*Philadelphia: P. Blakiston's Son & Co., 1923, 3. ed., pp. XXI+669, pl. 1, figs. 103*).—In the third edition of this volume previously known as The Ductless Glandular Diseases, American and English views on the subject have been incorporated, as in the earlier editions, in addenda to the several chapters constituting a translation of the German text. The subject matter is brought up to date, partly by bracketed additions to the text proper and partly by an extension of the addenda.

The implantation or enrichment of Bacillus acidophilus and other organisms in the intestine, R. P. Smith (*Brit. Med. Jour., No. 3334 (1924), pp. 948–950*).—Attempts to implant various microorganisms in the intestinal tract of typhoid and paratyphoid carriers are reported, with the following results:

The ingestion of *B. acidophilus* in milk in connection with a diet predominating in carbohydrate resulted in the transformation of the intestinal flora

until from 80 to 90 per cent of the organisms were of the *B. acidophilus* type. On discontinuing the feeding, the organism disappeared after from 4 to 5 days except when lactose feeding was continued after the feeding of *B. acidophilus* had been stopped. This resulted in one case in the persistence of the organism for some time. Negative results were obtained in attempts to implant *B. bulgaricus* and *B. coli* of the lactis aerogenes variety by feeding the organisms in milk, except when the feeding was preceded by the subcutaneous injection of the organism in question. In the subjects of the present study the reaction of the feces was not influenced by *B. acidophilus* or by lactose, but was rendered acid by the ingestion of milk inoculated with *B. lactis aerogenes* and *B. coli* (the inosite-fermenting type). The character of the feces was changed during the taking of milk containing *B. acidophilus* or of lactose in large quantities. The excretion of typhoid and paratyphoid bacilli in the feces of the chronic carriers was not influenced, but *B. coli* was to a considerable extent suppressed by feeding *B. acidophilus* milk.

Typhoid epidemic in Chicago apparently due to oysters, H. N. Bundesen (*Jour. Amer. Med. Assoc., 84 (1925), No. 9, pp. 641–650, figs. 3*).—Epidemiological data obtained concerning the outbreak of typhoid fever occurring in Chicago, Ill., during December, 1924, and January, 1925, are summarized and discussed.

Blue point oysters from one source were considered responsible for 69 cases, or 65.1 per cent of the entire number. A relatively large percentage of the remaining patients had eaten oysters during the same period, but it was impossible to trace these to their source. In commenting upon this outbreak, it is suggested that "steps should be taken to prevent interstate shipment of contaminated or infected oysters, and until such steps are taken by the Federal authorities, local health authorities should adopt regulations requiring a permit for the shipment of oysters; also, all oysters supplied should be labeled, showing the source of production and the establishment in which they were shucked and packed."

The relation of chronic poisoning with copper to hemochromatosis, F. B. Mallory (*Amer. Jour. Path., 1 (1925), No. 1, pp. 117–133*).—In this paper evidence is presented that chronic poisoning with copper is the cause of hemochromatosis, a disease manifesting itself by the deposition of a yellow pigmented derivative of hemoglobin, hemofuscin, in the endothelium lining the sinusoids and in the parenchymatous cells of the liver, and later in the smooth muscle cells of the arteries and veins and in the epithelium of the bile duct. The final result is pigment cirrhosis of the liver, pancreas, etc. The sources of the poisoning are distilled liquors contaminated with copper, occupations involving exposure to copper dust, and food materials cooked in copper kettles. The action of the poison is said to be exceedingly slow, from 15 to 25 years being required to produce the entire syndrome.

ANIMAL PRODUCTION

Animal breeding, L. M. Winters (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1925, pp. X+309, figs. 67*).—This book deals with the principles of animal breeding, the different sections of the book taking up the economic and biological background, the physiology of reproduction, heredity in animals, and the relation of these principles to practical breeding operations.

Recent hereditary teachings and animal breeding, C. Kronacher (*Neuzeitliche Vererbungslehre und Tierzucht. Freising-Munich: F. P. Datterer &

Co., 1924, pp. 30, fig. 1).—An account of the relation of the results of more recent experiments to practical breeding methods.

Castration, nutrition, and growth, P. A. Fish (*North Amer. Vet., 6 (1925), No. 2, pp. 21–43, figs. 14; abs. in Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 248–250, fig. 1*).—A study of the comparative growth of two castrated goats, one entire, and one young pregnant female goat is reported from the New York State Veterinary College. The ration fed consisted of ground corn and oats, bran, and hay. Salt and yeast were fed during a part of the experiment, and some green grass was available during the summer. A dermatosis appeared in the two castrated animals and in the pregnant female, but did not seem to be transmissible to other goats. The most unusual results were the poor conditions of nutrition in the castrated animals as measured by the rate of growth, resistance to disease, etc.

The effect of environmental temperature on metabolism, S. Morgulis (*Amer. Jour. Physiol., 71 (1924), No. 1, pp. 49–59*).—The results of a study of the metabolism in four dogs, conducted at temperatures varying from 10.5 to 31.6° C., indicated that changes in the external temperature do not alter metabolic activity except as they cause restlessness or induce a heightened muscular tone. The work was conducted in a Benedict closed circuit respiration apparatus, ingeniously constructed for showing slight movements of the dog on a hollow rotating kymograph.

Range studies as an aid in live-stock production, C. L. Forsling (*Producer, 6 (1924), No. 7, pp. 3–6, figs. 2; 6 (1925), No. 8, p. 8*).—This is a popular account of the results of investigations of range livestock production problems, as conducted at the western agricultural experiment stations, with reference to the need of further work on this subject.

Report of a departmental commisison appointed to inquire into and report upon the possibility of effecting improvements in the transit of livestock [etc.], 1923, J. A. Harris et al. (*Cape Town: Govt., 1924, pp. [2]+30*).—The recommendations of a committee appointed to investigate transportation of livestock and the development of the meat export trade in South Africa.

Composition and nutritive value of Hungarian alfalfa hay [trans. title], L. Weiser and I. Kelp (*Kisérlet. Közlem., 26 (1923), No. 1–4, pp. 20–30*).—The composition of the dry matter of 34 samples of alfalfa hay having a water content of about 13.5 per cent was found as follows:

Composition of alfalfa hay

	Crude protein	Amide	Pure protein	Crude fat	Crude fiber	Nitrogen-free extract	Ash
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Minimum	12.96	0.69	10.00	1.92	10.00	26.71	4.33
Maximum	27.55	5.87	22.35	4.90	34.66	37.86	9.04
Average	18.05	3.26	14.79	2.93	25.31	33.18	7.03

The analyses indicated that the first cutting of alfalfa hay was slightly inferior to the second, third, and fourth cuttings, which were about equal in value. The leaves were higher in the content of ash, crude protein, and fat, lower in fiber, and about equal in nitrogen-free extract to the stems. The nutritive value of different samples showed much variability, as determined in digestion experiments with sheep. The digestion coefficients for hays of different qualities as determined by the fiber content were found to vary accordingly.

Commercial feeding stuffs in Kentucky in 1924, J. D. Turner, H. D. Spears, and W. G. Terrell (*Kentucky Sta. Bul. 257 (1925), pp. 3–30*).—A summary of the official analyses of feeding stuffs collected in Kentucky during 1924, showing the name of the manufacturer, kind of feed, and number of samples equal to or below their guaranty.

Report of the International Congress for the Production of the Bovine Species (*Compte-Rendu des Travaux du Congrès International pour l'Élevage de l'Espèce Bovine. [The Hague]: Internatl. Cong. Rundveeteelt, 1923, pp. 246+796, pls. 3, figs. 9*).—This report of the congress held at The Hague from August 29 to September 4, 1923, is presented in two parts. Part 2 consists of the papers presented in the eight sections as follows:

Section 1a. *What new views regarding the doctrine of heredity must be considered as being of significance for cattle breeding?*—Attempt to a Genetical Analysis in Cattle According to Data from the Friesian Herdbook, by H. M. Kroon and G. M. van der Plank (pp. 1–49); The Methods of Improving Breeding Animals [trans. title], by D. L. Bakker (pp. 50–78); What New Meanings to Inheritance Must Become Evident for a Complete Understanding of Cattle Breeding? [trans. title] by C. Kronacher (pp. 79–126); The Working and Meaning of Selection and Inbreeding for Cattle Production [trans. title], by P. Tuff (pp. 127–148); To What Extent Have Actual Trials with Cattle Been Successful in Combining Desired Characteristics in One Animal by Crossing Different Breeds and Mating the Resulting Progeny in Accordance with the Teaching of Mendel? by J. Matson (pp. 149–159); Observations on the Inheritance of Morphological and Physiological Properties and Characteristics in Crosses of Red Spotted East Friesian with Kuhlaender Cattle [trans. title], by L. Adametz (pp. 160–168); On the Practical Reproduction in the Bovine Species [trans. title], by H. Helguera (pp. 169–187); Progress in Genetics and Its Influence on the Practices of Selecting Livestock [trans. title], by A. Pirocchi (pp. 188–192); Relation Between the Exterior Conformation and Milk Secretion in Dairy Cattle [trans. title], by F. Passino (pp. 193–197).

Section 1b. *What are the newer views regarding the science of feeding?*—The Net Energy of Feeding Stuffs for the Feeding of Dairy Cattle [trans. title], by N. Hansson (pp. 198–216); On the Present Position in Germany of the Important Question of the Physiology of Nutrition of Dairy Cattle [trans. title], by A. Scheunert (pp. 217–223); The Conservation of Grass as Dry Feed, So-Called Sweet Green Feed, and Electrically Preserved Feed [trans. title], by G. Wiegner (pp. 224–236); What Does the Newer Knowledge of Nutrition Mean to the Farmer? by G. Grijns (pp. 237–255); The Relation Between the Values of Sugar and Starch in the Production of Milk, by H. Isaachsen (pp. 256–271); New Views Regarding the Scientific Feeding of Dairy Cattle, Experiments in Connection with the Problem of the Requirements of Energy and Matter for Milk Production, and Investigations into the Question of the Possibility of a General Unit for Measuring the Productive Values of Feeding Stuffs, by H. Möllgaard (pp. 272–289).

Section 2a. *What particulars should be given in a pedigree register and in what manner must these particulars be collected in order that satisfactory guaranties are obtained concerning their accuracy?* (The manner in which the output of milk must be determined is here left out of consideration.)—What Particulars Should Be Registered in a Herdbook? by E. van Welderen Baron Rengers (pp. 290–305); What Information Must Be Recorded in the Herdbook and How Must the Same Be Assembled so That Its Accuracy Is Sufficiently Well Established? [trans. title] by H. Wibbens (pp. 306–330); Report on Registration in Norway, by J. Baashuus-Jessen (pp. 331–349); Notes on the Produc-

tion of a Pedigree Register, by V. H. Seymour (pp. 350–360); Importance of Measurements of Cattle and the Use of Those Recorded in the Herdbook [trans. title], by J. Marcq (pp. 361–367); The Material Recorded in Herdbooks and Its Theoretical Importance [trans. title], by J. Krizenecky (pp. 368–378); What Material Must Be Included in a Herdbook and How Must This Material Be Assembled to Furnish Sufficient Proof of Its Accuracy? [trans. title] by Peters (pp. 379–395); The Keeping of Herdbooks in the Union of the Livestock Raisers' Syndicate of East Flanders [trans. title], by C. van Damme (pp. 396–400).

Section 2b. *How should the milk yield and butter production be checked? Are international regulations possible?*—How Should Milk Control Be Conducted? by J. Mesdag (pp. 401–427); The Practical and Scientific Use of the Results from the Danish Milk Recording Societies (Cow-testing Associations), by A. Appel (pp. 428–445); How Must Milk Control Be Enforced and Are International Regulations Possible? [trans. title], by Hansen (pp. 446–459); A Large Cooperative Dairy in Italy [trans. title], by A. Robbiani (pp. 460–464).

Section 3a. *How can authorities otherwise than by veterinary measures assist in promoting the breeding of cattle?*—State Care of Cattle Breeding, by J. S. Swierstra (pp. 465–476); Red Danish Milk Cattle, by P. A. Mörkeberg (pp. 477–495); How May Cattle Breeding Be Furthered Other than Through Veterinary Means? [trans. title], by Attinger (pp. 496–510), by J. P. Zanen (pp. 511–523), by T. Monod (pp. 524–531), by Z. Zeman (pp. 532–537), and by F. Warnants (pp. 538–549); Scheme for the Improvement of Live Stock, by F. N. Webb (pp. 550–556).

Section 3b. *In what way can associations having for their object the improvement of the stock of cattle make a practical use of the particulars furnished by science and registration?*—In What Way Can Associations Which Have in Mind the Improvement of Cattle Production Assist the Registrar of the Associations? [trans. title], by J. Vos (pp. 557–577), and by Vogel (pp. 578–590); In What Way Can the Associations Which Foster the Breeding of Cattle Give the Most to Science Through Their Herdbooks? [trans. title], by J. Wozak (pp. 591–594).

Section 4a. *What characteristics ought cattle to possess in order to be satisfactory under certain circumstances?*—What Properties Must Cattle Possess to Furnish Definite Indications of Progress? [trans. title], by S. Koenen and W. de Jong (pp. 595–612), and by T. Brinkmann (pp. 613–637); What Properties Should Cattle Possess to Indicate Productive Improvement? [trans. title], by J. Duerst (pp. 638–649).

Section 4b. *How can tuberculosis among cattle be combated in a practical manner and what is the experience in regard to this in the various countries?*—Experience Obtained in Friesland in Endeavoring to Limit Tuberculosis Among Cattle, by A. H. Veenbaas (pp. 650–688); The Problem of Controlling Tuberculosis in Countries of Small and Average Production [trans. title], by H. Stoffel (pp. 689–709); How Can Bovine Tuberculosis Be Stamped Out in a Practical Way and What Progress Has Been Made Along This Line in the Different Countries? [trans. title], by Von Ostertag (pp. 710–758); The Campaign Against Tuberculosis Amongst Domestic Animals in Norway, by H. Holth (pp. 759–765); What Are We to Do for the Repression and Eradication of Tuberculosis in Cattle? by B. Bang (pp. 766–785); Observations on the Tuberculosis of Cattle in Italy and Its Practical Control [trans. title], by C. Terni (pp. 786–792); and How Can Bovine Tuberculosis Be Practically Combated in a Country and What Progress Has Been Made in the Different Countries? [trans. title], by G. ...llie (pp. 793–796).

The papers are presented in English, French, German, or Dutch and in most cases are abstracted in all four languages. The discussions of the papers are given in part 1 under the respective sections.

Metabolism of cattle during standing and lying, J. A. Fries and M. Kriss (*Amer. Jour. Physiol., 71 (1924), No. 1, pp. 60–83*).—An analysis of the data obtained in the earlier metabolism studies with cattle conducted in the respiration calorimeter at the Pennsylvania Institute of Animal Nutrition has revealed the occurrence of a considerable error in the relative division of the heat emission during standing and lying. The storage of heat in the platform while lying and the subsequent radiation upon rising have been found largely responsible for this error.

The authors summarize the factors pointing toward the discovery of the error as follows: "(1) An unaccountably large excess of heat in the standing as compared with the lying intervals, (2) the fact that there is no correlation between these increases of heat and the live weight of the animal, (3) a larger ratio of CO_2 to heat observed during standing than during lying, (4) a great variation in the observed ratios of CO_2 to heat in different intervals of either standing or lying during the same day, (5) the fact that the respiratory quotients during fasting do not correspond to the CO_2 heat ratios as observed for periods of standing and lying, and (6) the fact that with one cow during fasting the average observed CO_2 heat ratio for standing was a theoretically impossible value."

The authors have also devised a new method for computing the heat production to a standard day, as to standing and lying, without altering the heat due to digestion. This new method depends on the use of a correction factor for lying and standing which has been calculated for different live weights. The data necessary are the total heat production, live weight, and total time of standing.

Steer feeding in the sugar-cane belt, J. R. Quesenberry (*U. S. Dept. Agr. Bul. 1318 (1925), pp. 14, figs. 6*).—This bulletin reports the results of four years' work in comparing various silages for fattening 2- and 3-year-old steers at the Iberia Livestock Experiment Farm, near Jeanerette, Louisiana. In all the experiments 10 different rations were compared as follows: Corn silage, corn and soy bean silage, sorgo silage, sorgo and soy bean silage, corn and sorgo silage, corn, sorgo, soy bean, and cowpea silage, cane top silage, sugar cane silage, Japanese cane silage, and corn, sorgo, and soy bean silage. In addition to the silages fed, all lots received cottonseed meal at the rate of 2 lbs. per head daily at first, with increases gradually to 8 lbs. daily. During the first and third years' experiments no molasses was fed, but in the second and fourth years all lots received molasses diluted with water and sprinkled on the silage.

The combined results of the experiments showed that sorgo silage compared favorably with corn silage in the production of gains, the average daily gains per head being 1.99 lbs. in the former case and 2.13 lbs. in the latter. The addition of soy beans to corn or sorgo silage proved beneficial, the average daily gains per head being 2.28 lbs. by the lot receiving corn and soy bean silage as compared with 2.26 lbs. by the lot receiving sorgo and soy bean silage. There was little difference in the feeding values of the cane-top and sugar cane silages, but all were somewhat inferior to the corn and sorgo, the average daily gains produced by the lot receiving cane-top silage being 1.39 lbs., sugar cane silage 1.58, and Japanese cane silage 1.52 lbs. The feed requirements per pound of gain were also considerably greater in the lots receiving the cane silage.

Finishing baby beef, W. L. Blizzard (*Cattleman, 11 (1925), No. 9, pp. 49, 51*).—The results are reported of a comparative test of various combinations of feeds for finishing baby beef, conducted at the Oklahoma Experiment Station. The test period was 190 days in duration, four lots of 9 grade Hereford heifers each being employed as the experimental animals. The basal rations of all lots consisted of cottonseed meal, sorghum silage, and alfalfa hay with ground grains as follows: Lot 1 corn, lot 2 kafir, lot 3 wheat, and lot 4 milo. The comparative values of the feeds are summarized below:

Tests with various grains for baby beef

Lot	Average initial weight	Average daily gain	Feed required per 100 pounds gain				Average shrinkage per calf	Calculated profit per calf	Pork produced per calf
			Grain	Silage	Alfalfa hay	Cottonseed meal			
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*		*Pounds*
1	337	1.56	519	692	120	48	3	−$1.33	123
2	343	1.43	580	756	131	53	13	−5.20	113
3	333	1.73	459	623	108	43	9	4.79	165
4	345	1.41	568	765	133	53	8	−3.99	90

A survey of sheep production on 200 farms in northeastern North Dakota and northwestern Minnesota, 1924, and the general sheep situation, R. D. Jennings (*North Dakota Sta. Bul. 186 (1925), pp. 4–58, figs. 9*).—The results are reported of a survey of sheep production on 200 farms in northeastern North Dakota and northwestern Minnesota for the period from the breeding of the ewes in the late fall of 1923 to the marketing of the lamb crop in the fall of 1924. An analysis of the data obtained showed that sheep were profitable in this region and conflicted with other farm operations only at lambing time. They further tended to maintain the fertility of the soil and control weeds. The costs of raising sheep per head were found to be less in the larger flocks, and the gross incomes of the farms were greater. The kind of winter feeding, care at lambing time, and number of ewes bred per lamb were found to affect the profits materially. The kinds and amounts of feed, as well as pastures, are discussed. The best practice seemed to involve the use of sweet clover pasture in a 4-year rotation.

Sheep production, L. V. Starkey (*Clemson Agr. Col. S. C., Ext. Bul. 66 (1924), pp. 32, figs. 22*).—A popular account of the principles of sheep husbandry, with special reference to local conditions.

Soft pork investigations (*Georgia Sta. Rpt. 1924, pp. 79, 80*).—Analyses of the fat for melting point, iodine numbers, and refractive index have indicated that hogs softened by 2 months' feeding on peanuts followed by a 3 months' finishing period on corn, tankage, and other feeds failed to produce as hard a carcass as other hogs receiving the finishing ration throughout the entire trial. The finishing ration, however, tends to increase the hardness of the fat. In making analyses of the fat of pork variations have been found in samples selected from separate parts of the back of the same individual.

Pork production in Tunis [trans. title], C. Léger and J. A. Tournieroux (*Dir. Gén. Agr., Com. et Colon. [Tunis], Bul., 28 (1924), No. 117, pp. 267–311, figs. 7*).—The article discusses the numerical importance of swine in Tunis, and describes the breeds, methods of feeding, management, and control of diseases, with special reference to local conditions.

Economy of standard type in fowl, W. A. MAW (*Sci. Agr., 5 (1925), No. 7, pp. 224–228, figs. 8*).—The importance of individuality in the selection of breeding stock is pointed out.

How New Hampshire poultrymen use pullets as breeders, A. W. RICHARDSON (*Poultry Sci., 4 (1924–25), No. 2, pp. 51–54, figs. 2*).—This is an account of the methods used by New Hampshire poultrymen in producing their chicks from early hatched pullets. The poultry stocks consist mainly of Rhode Island Reds, and selection is particularly for early maturity.

Effect of low temperatures on hatching power of hens' eggs, F. E. MUSSEHL and P. BANCROFT (*Poultry Sci., 4 (1924–25), No. 2, pp. 79–81*).—In studying the effect of chilling on the hatchability of eggs at the Nebraska Experiment Station, lots of eggs were chilled for from 2 to 36 hours at 32° F. or from 0.5 to 1.25 hours at 15° prior to incubation. There was no lowering of the hatching power of the eggs by exposure to temperatures of 32° for 6 hours, nor did the lower temperature or longer exposure cause any marked reduction in the hatching percentage of the fertile eggs.

Feeding baby chicks, H. L. KEMPSTER (*Missouri Sta. Circ. 133 (1925), pp. 4*).—Popular directions for feeding baby chicks.

Nutrient requirements of growing chicks, F. E. MUSSEHL and P. M. BANCROFT (*Poultry Sci., 4 (1925), No. 3, pp. 118–122, figs. 3*).—In experiments at the Nebraska Experiment Station chicks developed rickets in from 4 to 8 weeks when raised in light filtered through glass on a ration of yellow corn and wheat, equal parts, for a scratch feed and a mash of which 85 per cent consisted of equal parts of yellow corn meal, wheat bran, wheat shorts, and pulverized barley, and 15 per cent of sifted meat meal. Normal growth was obtained when exposure of 45 minutes daily to direct sunlight was allowed. The addition of cod liver oil as 3 per cent of the mash improved the growth of the chicks raised in filtered light, but did not produce normal growth nor did this addition improve the rate of growth when 45 minutes' exposure to direct sunlight was allowed. Rickets developed when extracts of alfalfa meal, hydroquinone, and dried yeast supplemented the ration as fed under glass. The chicks used in the experiments were from 7 to 10 days of age at the start.

Rearing chicks to maturity indoors, R. M. BETHKE and D. C. KENNARD (*Poultry Sci., 4 (1924–25), No. 2, pp. 74–78, fig. 1*).—The authors report the results of an experiment at the Ohio Experiment Station in which day-old chicks were raised indoors from October 17, 1923, to June 30, 1924. A mixture of 2 parts of ground white corn to 1 part of standard wheat middlings furnished 80 per cent of the ration, while the rest consisted of 16 per cent of casein and 4 per cent of minerals. Cod liver oil to the extent of 2.5 per cent was also added.

The birds made practically normal growth and started laying at 4.5 months of age. A distinct paleness of the shanks was noted during the indoor feeding period, which disappeared when the birds were placed on range at the conclusion of the test. Other experiments have shown that chicks may be raised indoors using fresh egg yolk as the source of the fat-soluble vitamins.

Essential minerals for chicks and laying hens, D. C. KENNARD (*Poultry Sci., 4 (1925), No. 3, pp. 109–117*).—The results of several experiments in comparing minerals for egg production are reported from the Ohio Experiment Station. In one experiment the reduction in egg production brought about by adding 10 per cent of meat scrap to the mash as compared with 20 per cent of meat scrap, was found to be due to a deficiency in the mineral content, since production was maintained when a mineral mixture previously described (E. S. R., 52, p. 476) was furnished with the 10 per cent meat scrap mash.

In another test oyster shells proved superior to limestone grit as a source of calcium for maintaining egg production. When mica grit replaced oyster shells and limestone, egg production, egg size, and the breaking strength of the shells were much reduced.

Influence of ultra-violet light on young laying hens, J. S. Hughes and L. F. Payne (*Science, 60 (1924), No. 1563, pp. 549, 550*).—Two lots of 12 Leghorn pullets each were selected for studying the effect of ultraviolet light treatments for 10 minutes daily on the egg production and hatching qualities of the eggs at the Kansas Experiment Station. The ration fed both lots consisted of yellow corn 82 per cent, tankage, casein, and butterfat each 5 per cent, and bone ash 3 per cent, with sprouted oats and oyster shells ad libitum. The birds were started in the experiment on October 1, 1923, but the light treatments began on January 23, 1924, and lasted for 16 weeks.

No significant differences in egg production were noted previous to the light treatments, but during the 16 weeks of the test the pen receiving the light laid 497 eggs as compared with 124 by the pen not receiving light. There was also about 30 per cent more calcium in the shell and 5 per cent more in the contents of the eggs, and the hatchability was 78 per cent as compared with 40 per cent for the untreated pen. Six of the hens died in the untreated pen during the last half of the 16-week period, and ruptured eggs were common. The reversal of the light treatment beginning June 1 produced similar results, egg production being 34 per cent in the treated pen and 23 per cent in the untreated pen. The egg shells were likewise stronger.

The cause of olive-colored egg yolks, L. F. Payne (*Poultry Sci., 4 (1925), No. 3, pp. 102–108, figs. 5*).—The author briefly describes several tests at the Kansas Experiment Station in which the feeding of shepherd's purse (*Capsella bursapastoris*) or field pennycress (*Thlaspi arvense*) caused the production of eggs having both the yolk and white tinted with green. The birds in the experiments had not received green feed for some time prior to the tests so that the relative consumption of the weeds was large. Alfalfa, wheat pasture, or sprouted oats did not produce a similar change in the eggs. Negative results also occurred from the feeding of tannin, mustard seed, and rape.

Poultry housing in Florida, N. W. Sanborn (*Poultry Sci., 4 (1925), No. 3, pp. 123–126, figs. 2*).—A discussion of the housing problem in Florida, with illustrations of the type of poultry house recommended by the university.

Modern fresh-air poultry houses, P. T. Woods (*Sellersville, Pa.: Item Pub. Co., 1924, pp. 189, figs. 98*).—A popular account on the housing of poultry, with special reference to the open front types of houses.

The rat: Data and reference tables for the albino rat (Mus norvegicus albinus) and the Norway rat (Mus norvegicus), compiled by H. H. Donaldson (*Mem. Wistar Inst. Anat. and Biol. No. 6, 2. ed., rev. (1924), pp. XIV+469, figs. 85*).—This is a revised and enlarged edition of the book previously noted (E. S. R., 40 p. 546).

DAIRY FARMING—DAIRYING

The efficiency of utilization of protein in milk production, as indicated by nitrogen balance experiments, E. B. Forbes and R. W. Swift (*Jour. Dairy Sci., 8 (1925), No. 1, pp. 15–27*).—This study is based on 45 metabolism balance periods, averaging 18 days in duration, conducted with Holstein-Friesian cows during the first half of lactation, the results of which with special reference to the mineral balances have been reported in earlier publications from the Ohio Experiment Station (E. S. R., 35, p. 481; 37, p. 180;

40, p. 373; 48, p. 375). An average of 31.6 ± 0.4 per cent of the nitrogen in the feed was utilized by these animals. This was equivalent to a 38 ± 0.5 per cent utilization of the utilizable nitrogen (feed N minus maintenance N). There was no association established between the efficiency of the nitrogen utilization and the plane of nutrition, but it is stated that the efficiency would have been greater had less nitrogen been fed, since there was an average storage of 8.1 gm. of nitrogen per day and an increase of 1.8 gm. in live weight.

Urea and glycocoll as protein substitutes in experiments with milk goats [trans. title], E. Ungerer (*Biochem. Ztschr., 147 (1924), No. 3–4, pp. 275–355*).—The results of an investigation of the efficiency of urea and glycocoll for replacing part of the protein in the rations of 6 milk goats are reported from the University of Breslau. The investigation was conducted over seven periods during which the animals were weighed daily, and analyses of the feed consumed and urine, feces, and milk produced were made and the nitrogen balances calculated.

In periods 1 of 25 days', 3 of 14, 5 of 16, and 7 of 19 days' duration, a basal ration was fed. The amounts of the different ingredients in the basal ration varied according to the live weight and milk production, but they were kept constant throughout all basal periods for the same individual. The daily basal ration consisted of from 800 to 1,200 gm. of meadow and clover hay, 150 to 300 gm. of linseed meal, 200 gm. of wheat chaff, 200 gm. of oats, 100 gm. of dried yeast, and 50 gm. of crystal sugar. During period 2 of 16 days, 16 gm. of urea and 100 gm. of sugar, containing 7.4 gm. of digestible nitrogen, replaced 100 gm. of yeast and 50 gm. of wheat chaff containing 7.28 gm. of nitrogen. During period 4 of 30 days, 25 gm. of urea and an average of 210 gm. of sugar, containing 11.55 gm. of nitrogen, replaced 100 gm. of yeast, 150 gm. of wheat chaff, and 200 gm. of hay containing 11.23 gm. of nitrogen. During period 6 of 17 days' duration, 70 gm. of glycocoll and 200 gm. of sugar, containing 13.04 gm. of nitrogen, replaced 100 gm. of yeast, 100 gm. of linseed meal, 50 gm. of wheat chaff, and 200 gm. of hay containing 12.97 gm. of nitrogen. The sugar was added to the rations in which the nonprotein nitrogen materials were substituted for part of the protein to make both rations of a similar energy value. There was a 5-day transition period preceding each of the three experimental periods.

The results showed that the protein feeds during the basal periods maintained a strong positive nitrogen balance, with an increase in body weight and a high rate of milk production. The substitution of the nonprotein nitrogen proved inferior in practically all these characteristics. The relative substitution efficiency was greater with the smaller amount of urea, it being calculated at 77 per cent when 7.4 gm. of nonprotein nitrogen replaced a similar amount of protein nitrogen and at 63 per cent when 11.35 gm. of nonprotein nitrogen replaced a similar amount of protein nitrogen. The efficiency of 13.04 gm. of nitrogen in glycocoll was 68 per cent as high as a like amount of protein nitrogen in the feeds replaced. The nitrogen content and amount of urine were increased during the periods when urea and glycocoll were fed. The substitution feeds also resulted in decreases in the amount of milk and total solids and an increase in the fat content of the milk.

The author concludes that urea and glycocoll nitrogen can not be substituted for protein nitrogen and an equal production maintained.

Experiments on the possible effect of vitamins on quantity of milk and butter fat, E. J. Sheehy (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1924), No. 42, pp. 333–336*).—In a study at the Albert Agricultural College and the

of the milk produced by goats, two animals were fed for some time prior to and following parturition on rations deficient in vitamins A and B, respectively. When the missing vitamin was later added to the deficient ration no significant change in the quantity or fat content of the milk was evident.

The keeping qualities of milk as affected by the various factors which enter into the production and handling, A. E. BERRY (*Ontario Bd. Health Ann. Rpt., 42 (1923), pp. 78–88*).—The results are reported of a series of tests of the influence of various methods of cleaning dairy utensils and of different conditions of milking on the keeping quality of the milk produced by the herd at the Ontario Hospital at Whitby. These results show that dairy utensils are a more likely source of contamination than dirty cows, dusty stables, or carelessness in milking. Any of these factors may shorten the keeping quality of the milk, but, with reasonable care, dirty utensils are a much more likely source of contamination. Sterilizing the cans increased the keeping quality of the milk from 20 to 30 per cent. The length of storage in these cans, however, had little effect on the duration of keeping. Steam proved to be the most thorough method of sterilizing.

Some notes on the effect of heat on members of the colon typhoid group in milk, F. W. TANNER and G. C. DUBOIS (*Jour. Dairy Sci., 8 (1925), No. 1, pp. 47–53*).—The results of a series of tests at the University of Illinois of the amount of heat required to kill *Bacterium coli*, *B. typhosus*, *B. paratyphosus* A and B, and *B. dysenteriae* in milk cultures indicated that a temperature of 60° C. for 30 minutes destroyed these organisms when present in amounts that would occur in commercial milk samples.

Investigation of the constancy of the melting and solidifying points of butterfat [trans. title], W. MOHR (*Milchw. Forsch., 2 (1924), No. 1–2, pp. 24–30*).—The results of an investigation at the Dairy Institute at Kiel showed that the melting and solidifying points of butterfat were not as constant as similar determinations for pure chemical compounds, but drying, aging, and the size of the sample did not alter the temperature at which these changes occurred.

Some faults in butter, E. GRAHAM (*Queensland Agr. Jour., 22 (1924), No. 1, pp. 3–7*).—Flavors in butter due to wood and mold and yeast growths were discussed. Experiments showed that butter boxes made of seasoned pine and lined with dry paper were the best for preventing the wood taints, while unseasoned pine and paraffining were unsatisfactory. Proper pasteurization of the cream is recommended to prevent yeast and mold flavors.

Practical butter and cheese making, L. J. LORD (*London: Ernest Benn, Ltd., 1925, pp. 200, pls. 10*).—Practical directions for the manufacture of butter and cheese, including a chapter on dairy buildings and a foreword by E. Mathews.

Different types of milk, their relation to the rennet, and their importance in cheesemaking, A. G. KOESTLER (*Jour. Dairy Sci., 8 (1925), No. 1, pp. 28–36*).—Studies of differences in the quality of milks for cheese making at the Federal Dairy and Bacteriological Research Station at Bern, Switzerland, have revealed the occurrence of three abnormal types of milk designated as A, B, and C.

Type A milk curdles very quickly with rennet, and the stage of gel formation is abnormal in development. Such milk is secreted by cows having more or less inflamed udders, with the presence of bacteria. The composition of this type of milk differs from normal milk both in chemical and physiological properties, there being an increase in the content of catalase, leucocytes, sodium chloride, and highly dispersed nitrogen compounds as globulin and albu-

min and a decrease in the content of total dry matter, fat-free dry matter, milk sugar, calcium phosphate, and acidity.

Type B milk is normal in composition but shows no tendency to curdle after adding rennet. The addition of calcium chloride to this milk, however, overcomes this difficulty. Type C milk is likewise normal in chemical composition, but after coagulation the normal drying of the curd is much delayed. The addition of calcium chloride to this milk renders gel formation normal.

The relation of the fat content of the kettle milk to the fat content of the dry matter of Weisslaker cheese [trans. title], H. MARTIN (*Milchw. Forsch., 2 (1924), No. 1–2, pp. 16–21*).—The fat, water, and salt content of Weisslaker cheese, taken from the first day to the eighteenth week of ripening, are reported. One-half of the samples were salted with dry salt, while the others were salted in brine. The results showed that the fat content of the cheese decreased during the 18 weeks' ripening, the amounts being 2.66 per cent in the lot treated with dry salt and 3.89 per cent in the lot salted in brine. This was accompanied by a gradual increase in the salt content of the inside of the cheese irrespective of the method of salting. The production of Weisslaker cheese was shown to be more costly than that of Limburger cheese.

The solution of zinc and copper plating by milk and whey [trans. title], K. VAS (*Kisérlet. Közlem., 26 (1923), No. 1–4, pp. 1–7*).—The author reports the amount of zinc and copper dissolved by sweet and sour milk and whey from iron cans plated with zinc and copper. Cans having both smooth and ribbed surfaces were used in the experiment. The work is abstracted in German.

Milk sugar from whey: Experiments at the ministry's lactose factory (*Jour. Min. Agr. [Gt. Brit.], 31 (1925), No. 11, pp. 1030–1034*).—The results are reported of experiments at the ministry's factory at Haslington, which deal with the manufacture of by-products from whey. In the process the butterfat was first removed by a cream separator at a temperature of 170° F. The butter produced from the whey cream was almost indistinguishable from normal butter. The lactalbumin was coagulated from the skimmed whey by first adjusting the acidity so that 10 cc. was neutralized by from 3.5 to 5 cc. of N/10 alkali, after which it was heated to 200° and removed by filtering. The filtrate was then evaporated and the sirup allowed to crystallize.

The calcium lactate was removed from the sugar during refining by several methods, the most successful being to precipitate the calcium by disodium phosphate. The products obtained per 1,000 gal. of whey were approximately 20 lbs. of butter, 58.5 of lactalbumin, and from 20 to 30 lbs. of refined lactose. The cost of the operations is pointed out as making these processes of doubtful economic value except under favorable conditions.

Minnesota creameries, cheese, ice cream, and canning factories, 1924, C. HERN (*St. Paul: Minn. Dairy and Food Dept., 1924, pp. 109, pls. 2, figs. 19*).—Statistics of the milk and cream received and butter and cheese produced in Minnesota from 1911 to 1923 and a list of the operating creameries for 1924.

VETERINARY MEDICINE

Special pathological anatomy of domestic animals, E. JOEST (*Spezielle Pathologische Anatomie der Haustiere. Berlin: Richard Schoetz, 1923, vol. 3, pt. 1, pp. III+410, figs. 188; 1924, pt. 2, pp. [6]+411–905, pls. 4, figs. 303*).—This is in continuation of the work previously noted (E. S. R., 50, p. 879). The first part deals with the ductless glands, male genital organs, and urinary organs, and the second part with the respiratory system.

Veterinary hygiene, J. Gregg (*Omagh, Ireland: S. D. Montgomery, Ltd., [1924], pp. 147, figs. 29*).—This is a practical account.

Text-book of meat hygiene, with special consideration of antemortem and postmortem inspection of food-producing animals, R. Edelmann, rev. by J. R. Mohler and A. Eichhorn (*Philadelphia: Lea & Febiger, 1925, 5 ed., rev., pp. VI+17-478, pls. 5, figs. 161*).—This is the fifth, revised edition of the work previously noted (E. S. R., 41, p. 81).

The erythrocyte and the action of simple haemolysins, E. Ponder (*Edinburgh: Oliver & Boyd, 1924, pp. X+192, figs. 11*).—Part 1 of this work (pp. 1–86) deals with the morphology, chemistry, and structure of erythrocytes, and part 2 (pp. 89–181) with the action of simple hemolysins. A bibliography of 169 titles is included.

Studies on the pathological histology of experimental carbon tetrachloride poisoning, G. H. Gardner, R. C. Grove, R. K. Gustafson, E. D. Maire, M. J. Thompson, H. S. Wells, and P. D. Lamson (*Bul. Johns Hopkins Hosp., 36 (1925), No. 2, pp. 107–133, figs. 6*).—This is a report of extended investigations by the departments of pathology and pharmacology at Johns Hopkins University. The conclusions drawn from the investigations are as follows:

"Carbon tetrachloride causes central necrosis of the liver when (1) given by mouth, (2) the vapor is inhaled, (3) it is injected subcutaneously, or (4) intraperitoneally, and (5) it is administered per rectum. Lesions other than those found in the liver are inconsequential after oral administration of CCl_4. The smallest oral dose of CCl_4 which will produce liver necrosis has not been definitely determined. In our original series 0.5 cc. CCl_4 per kilogram [of body weight] was the smallest, but more recently one of us has found necroses after doses of 0.176 cc. CCl_4 per kilogram. Definite liver necrosis has been observed as early as 12 hours after oral administration of CCl_4. The maximum lesion occurs about 48 hours after dosage. Healing of liver lesions begins three or four days after oral administration of CCl_4 and is not completed in five weeks. The extent of the liver necrosis does not increase uniformly as the size of the oral dose of CCl_4 administered is increased.

"Puppies are more susceptible to CCl_4 administered by stomach tube than are adult dogs. Rabbits are more susceptible to CCl_4 administered by stomach tube than are adult dogs. Simultaneous oral administration of alcohol with 4 cc. CCl_4 per kilogram to adult dogs markedly increases the toxicity of CCl_4, as shown by the tremendous liver destruction and high death rate. Oral administration of cream before 4 cc. CCl_4 per kilogram does not greatly alter either the amount of liver destruction or the death rate. Intraportal injections of CCl_4 produce only diffuse hemorrhagic liver necroses. Injections of CCl_4 into a peripheral vein produce only foci of hemorrhage, edema, and an occasional area of necrosis in the lungs."

A list of 18 references to the literature is included.

Stock dips, H. H. Green (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 3, pp. 259–268*).—This is an explanation of the regulations controlling the sale of stock dips in South Africa.

New and nonofficial remedies, 1923 [and 1924] (*Chicago: Amer. Med. Assoc., 1923, pp. 415+XXXVI; 1924, pp. 422+XXXIX*).—These continue for 1923 and 1924 the series previously noted (E. S. R., 47, p. 383).

Report of the Ontario Veterinary College, 1924 (*Ontario Vet. Col. Rpt. 1924, pp. 72, figs. 10*).—This report includes the following accounts: Retained Placenta and Its Sequelae in Cows (pp. 10–13), Impotency in Bulls (pp. 13–15), Sterility in Cows (pp. 15–18), and Stomach Worm Disease in Sheep (pp.

18, 19), all by R. A. McIntosh; A Study of the Normal Histology of the Domestic Fowl (pp. 21-31) and Some Notes upon Neoplasms as They are Observed to Occur in Domesticated Animals (pp. 31, 32), both by H. E. Batt; Malignant Catarrh of Cattle (pp. 34-37), Broncho-pneumonia in Calves and Casual Infections in Cattle (pp. 37, 38), A Note on Rape Poisoning in Cattle (pp. 38, 39), Acute Pulmonary Congestion in Calves (pp. 39, 40), Acute Alveolar Emphysema in Calves (pp. 40, 41), An Investigation into an Endemic Disease of Horses (pp. 41-50), Cerebro-spinal Meningitis in Horses (p. 50), The Inoculation of the Pregnant Mare to Prevent Joint Ill in the Foal (pp. 50, 51), and An Unusual New Growth (Cylindroma) (p. 52), all by F. W. Scofield; and Some Notes on Avian Diphtheria (Chicken-pox) (pp. 54-61), Contagious Nasal Catarrh in Fowl (Roup) (pp. 61-64), Vent Gleet (Cloacitis) (pp. 65, 66), Edema of the Wattles (pp. 66-68), Bacillary White Diarrhea in Chicks and *Salmonella pullora* Infection in Adult Fowl (pp. 68-70), and Fowl Cholera (pp. 70-72), all by R. Gwatkin.

Abortion disease of cattle, C. C. PALMER (*Del. Univ., Agr. Ext. Circ. 19 (1925), pp. 27, figs. 7*).—This is a practical summary of information.

Human infections with Bacillus abortus (*Jour. Amer. Med. Assoc., 84 (1925), No. 14, pp. 1047, 1048*).—This is a review of recent work with *B. abortus* and its relation to the Malta fever organism.

Attempts at cutaneous vaccination against B. abortus Bang [trans. title], H. VIOLLE (*Compt. Rend. Soc. Biol. [Paris], 92 (1925), No. 6, pp. 421, 422*).—The author claims to have infected guinea pigs with *Bacillus abortus* by rubbing into the epilated but not scarified skin a salve containing living organisms, and to have immunized them against the bacilli by three successive frictional applications on the skin of salve containing the bacilli killed by heat.

The incidence of anthrax in stock in Australia, M. HENRY (*Roy. Soc. N. S. Wales, Jour. and Proc., 56 (1922), pp. 44-61*).—This review of the situation deals with vaccination, seasonal incidence, localization of anthrax, mortality, source of infection of anthrax in Australia, and the reason for the decline of anthrax.

The influence of the "diaplyte" antigen of Dreyer on tuberculosis of the guinea pig, J. J. BRONFENBRENNER and E. L. STRAUB (*Jour. Expt. Med., 41 (1925), No. 2, pp. 257-274, figs. 10*).—This investigation of the therapeutic and prophylactic value of the Dreyer antigen (E. S. R., 51, p. 80) in experimental tuberculosis of guinea pigs included two series of experiments in which the animals were rendered tuberculous by the injection of tubercle bacilli and were then given subsequent treatment with the Dreyer antigen at regular intervals starting at different times after the inoculation of the virulent bacilli, and a third smaller series in which the animals were infected without shock by exposure to cage infection or conjunctival instillation after preliminary treatment with the defatted antigen.

The data obtained in all three series showed consistently that the Dreyer antigen not only failed to yield beneficial results but caused earlier development of lesions and death. In comparing these results with the favorable results reported by Dreyer, the authors suggest as possible factors responsible for the difference high individual resistance, difference in the quality of the vaccine, mistakes in duration and intensity of treatment, and uncertainty as to the most favorable time for treatment.

Tuberculosis in poultry, H. WELCH (*Montana Sta. Circ. 127 (1924), pp. 11, figs. 7*).—This is a revision of Circular 57, previously noted (E. S. R., 35, p. 786).

Scrapie, S. H. GAIGER (*Jour. Compar. Path. and Ther., 37 (1924), No. 4,*

of observations of its progress among sheep once it has gained entrance to the flock on the farm, the influence of the ram in its spread, etc.

Observations on the life history of Triodontophorus tenuicollis, a nematode parasite of the horse, R. J. Ortlepp (*Jour. Helminthol., 3 (1925), No. 1, pp. 1-14, figs. 9*).—This is a report of investigations conducted at the Institute of Agricultural Parasitology of the London School of Hygiene and Tropical Medicine.

The author finds that "during the free-living development the larvae of *T. tenuicollis* undergo two molts separating three larval stages, the last stage remaining ensheathed in the cuticle of the previous stage. The development takes about four days when the eggs are cultured in horse feces and charcoal at 26° C. [78.8° F.]. The infective or third stage larvae are climbers, and also show a marked resistance to desiccation; they can also withstand variations in temperature from −8 to 60°. They do not penetrate skin. Infection of the host is probably via the mouth during grazing. The fourth-stage larva is described. It is free in the lumen of the colon, possesses a well-marked larval buccal capsule and three stout and pointed esophageal teeth. Sex differences are now present. The adult buccal capsule develops in the form of a vesicle round the base of the larval buccal capsule. The probable mode of its parasitic development is given. A fourth-stage larva, probably that of either *T. brevicauda* or *T. serratus*, is described."

Testing chickens for bacillary white diarrhea, D. D. Baker (*Vet. Med., 20 (1925), No. 5, pp. 208-210*).—A discussion of the technique.

Investigations of the coccidia and coccidioses of the rabbit [trans. title], C. Pérard (*Ann. Inst. Pasteur, 38 (1924), No. 11, pp. 953-976, figs. 5*).—The finding of A. Lucet in 1913[2] that it is possible to produce a pure hepatic coccidiosis in young rabbits led to the conclusion that two species of coccidia probably attack the rabbit. Investigations conducted by the author in the laboratory of protozoology at the Pasteur Institute confirm this view. Pure cultures can be obtained of the two (which frequently occur in the same host), namely, *Eimeria stiedae* Lind. (1865) attacking the liver, which becomes hypertrofied, and *E. perforans* Leuc. (1879) the intestines. The death of young rabbits is caused by *E. stiedae* in from 3 weeks to 1 month and by *E. perforans* in from 6 to 15 days.

The morphology and biology of the rat coccidium Eimeria nieschulzi n. sp. and its occurrence in the Netherlands, C. P. A. Dieben (*Over de Morphologie en Biologie van het Rattencoccidium Eimeria nieschulzi n. sp. en Zijne Verspreiding in Nederland. Proefschr., Veeartsenijk. Hoogesch., Utrecht, 1924, pp. 119, pls. 3, figs. 8*).—This is a report of studies of a coccidium occurring in wild rats (*Mus norvegicus* and *M. rattus*), the developmental stages of which are localized in the small intestine and in the cecum. The paper includes a bibliography of eight pages.

AGRICULTURAL ENGINEERING

Annual report of the Reclamation Service, 1922–23, E. F. Drake, V. Meek, and J. S. Tempest (*Canada Dept. Int., Reclam. Serv. Ann. Rpt., 1922–23, pp. 94, pl. 1, figs. 10*).—This is the annual report of the director of the Reclamation Service of Canada for the year 1922–23, including sections on irrigation and drainage. The irrigation section contains considerable data on irrigation investigations, special reference being made to duty of water investigations at the Brooks Experimental Station and on farms in the Coaldale district. The results are taken to indicate that even during the past six dry

[2] Compt. Rend. ...

seasons in southern Alberta, there has been enough precipitation when added to the legal duty of water to produce all the moisture required for any crop.

A study of coastal ground water, with special reference to Connecticut, J. S. Brown (*U. S. Geol. Survey, Water-Supply Paper 537 (1925), pp. VIII+101, pls. 7, figs. 20*).—This report, prepared in cooperation with the Connecticut State Geological and Natural History Survey, contains a preface by O. E. Meinzer and the results of a study of the coastal ground water of Connecticut.

The conclusion is drawn that on the New Haven coast the zone in which the shallow ground water is contaminated by percolation or diffusion of salt water is extremely narrow. The greatest distance from the shore at which contamination, even a trace, is suspected is 250 ft., and contamination more than 100 ft. from the high tide shore line is unusual. About half the drilled wells in a zone a few hundred feet wide along the shore also showed some evidence of contamination, and it is considered certain that the danger of obtaining salt water increases with the depth of drilling. The safe ratio of depth of well below sea level to distance from the shore is placed at about 1:1.

Geology and ground-water resources of Townsend Valley, Montana, J. T. Pardee (*U. S. Geol. Survey, Water-Supply Paper 539 (1925), pp. IV+61, pls. 2, figs. 7*).—Data are presented from a study of the geology and ground water resources of an area of 600 square miles in west-central Montana.

Ground water that is hard but potable and suitable for most ordinary uses is found near the surface in the lowlands and at depths ranging from 100 to 300 ft. in the bench lands. In most places the ground water is abundant; its chief source is seepage from the mountain streams, and it is extensively used for domestic and public supplies. In the valley generally conditions are unfavorable to the occurrence of ground water under sufficient pressure to produce flowing wells.

Surface water supply of Colorado River basin, 1919 and 1920 (*U. S. Geol. Survey, Water-Supply Paper 509 (1925), pp. V+269, pls. 2*).—This report prepared in cooperation with the States of Arizona, Colorado, Utah, and Wyoming, presents the results of measurements of flow made on streams in the Colorado River basin during the years ended September 30, 1919 and 1920.

The composition of the waters of the great Australian artesian basin in South Australia and its significance, R. L. Jack (*Roy. Soc. So. Aust. Trans. and Proc., 47 (1923), pp. 316–321, pls. 3*).—A large amount of graphic and analytical data on the composition of the waters of the great Australian artesian basin is presented and briefly discussed.

Use and waste of irrigation water, G. E. P. Smith (*Arizona Sta. Bul. 101 (1925), pp. 265–293, figs. 11*).—This bulletin deals with transpiration and other water losses in irrigation practices, discusses the efficiency of irrigation, and gives 17 rules governing the proper use of irrigation water.

Discharge of irrigation siphons in California, L. S. Hall (*Engin. News-Rec., 93 (1924), No. 26, pp. 1024, 1025, fig. 1*).—The results of discharge measurements made on irrigation siphons ranging in diameter from 6 to 12 in. and in length from 100 to 150 ft. are reported in tabular and graphic form. Two 15° bends separated by 20 ft. of straight pipe were used where the siphons passed over the tops of levees. The measurements were made by means of submerged orifices set in ditches below the outlet of the siphons.

The measured head varied from 1.35 to 0.1 ft. for individual measurements on different siphons. The coefficient of friction loss in the pipe was found to average 0.068 in the formula

$$H=\frac{v^2}{2g}\left(1+K_e+K_f\frac{L}{D}\right).$$

in which H = total loss in head in feet, V = velocity in feet per second, g = acceleration due to gravity, K_0 = coefficient of loss at entrance, K_1 = coefficient of friction loss in pipe, L = length of pipe in feet, and d = diameter of pipe in feet, when the value of the coefficient of loss at entrance was assumed as 0.78.

An analysis of the weir coefficient for suppressed weirs, C. W. Harris (*Wash. [State] Univ., Engin. Expt. Sta. Bul. 22 (1923), pp. 21, figs. 9*).—What is considered to be the development of a more rational analysis of the weir coefficient is presented in this bulletin.

California irrigation district laws as amended 1923 (*Calif. Dept. Pub. Works, Div. Engin. and Irrig. Bul. 7 (1923), pp. 183*).—The text of the laws is given.

Report of the State irrigation commissioner, G. S. Knapp (*Kans. State Irrig. Commr. [Bien.] Rpt., 1923–1924, pp. 42*).—A report of the work and expenditures of the division of irrigation for the biennium July 1, 1922, to June 30, 1924, is presented. This includes a general review of the work of the department, results of measurements of flow made on streams in the State, and a discussion by the author on the irrigation problem in Kansas, in which special attention is drawn to experimental work on irrigation pumping.

Plan of assistance to hydraulic works for irrigation purposes (*Plan de Auxilios á las Obras Hidráulicas con Destino á Riegos. Pamplona: Prov. Navarra [Spain] Dir. Agr., 1923, pp. 27, pl. 1*).—This publication outlines a study of the possibility of establishing a general plan of aid to hydraulic works in the Province of Navarra, in Spain, for the purpose of developing irrigation practice.

Studies of the circumstances affecting the condition of drainage canals [trans. title], P. Kokkonen (*Acta Forest. Fennica, 27 (1924), pp. VI+1–220, pls. 16, figs. 68*).—The results of an extensive study of the factors affecting the condition of drainage canals in Finland are presented in considerable detail. A review of the literature bearing on the subject is given and the locations where observations were made are described. The studies are divided into two parts. Part 1 deals with the action of materials derived locally in obstructing drainage channels.

Studies of crumbling showed that on the whole this phenomenon occurs in soils of nearly or perfectly loose consistency, such as decayed forest or peat soils, or in sandy, silty, and silt clay soils. The range of crumbling was found to be greater in soils in which the channel cuts through overlying peat layers into the mineral substratum than in peaty and mineral soils alone. It was greatest in the former soils where the subsoil was fine grained. Crumbling is apparently largely brought about by too steep side slopes.

Studies of rolling or slipping breaches showed that such breaches may be classified according to the motion of the earth as rollings, slips, and filling breaches. Rollings were found to occur mainly in sandy and silty soils. Crumbling slips occur chiefly in silty clay soils and rarely in silty soils. Other kinds of slips occur only in clayey and muddy soils and in laminated soils underlaid by clay and mud. Filling breaches occur in muddy, silty, and peaty soils. The deeper the channel the greater was the motion of the earth.

The chief cause of breaches was found to be due to the increase in earth pressure from deepening the channel and cutting the sides steeper. This pressure may be increased if the excavated earth is laid too near the sides. In some cases the earth pressure was found to be increased by damming during excavation and by erosion. A decrease in earth resistance favorable

by earth contraction. It was also found that in all drainage districts in which breaches have occurred the natural soil moisture was very high, amounting in slips to 60 per cent and in filling breaches up to 80 or 90 per cent. As a rule breaches were found to occur in the course of the same summer during which excavation took place.

Studies of upheavals showed that they occur in very wet swamps and fens where the peat has no sustaining power, and in clayey soils if layers of miry clay exist under a stiff layer of earth to which the channel does not quite reach. Upheavals were found to contract channels and sometimes to efface them altogether. The former took place in undecayed, homogeneous swamps with some sustaining power and generally in clayey soils, mainly in those near seacoasts. The latter occurred in especially wet boggy swamps partially decayed. In upheavals, especially those occurring in undecayed swamps, the channel appears to rise up, thus reducing the drainage efficiency of the diminished canal section.

Studies of protrusions showed that one-sided protrusions occur in protecting ditches cut in the outskirts of large fens in the side of the channel bordered upon by the fen. Total two-sided protrusions occurred in canals cut in large fens which were not particularly wet, and which contained relatively few canals or none. It was found that partial protrusion may occur in all such fens and swamps as are coverd by a layer of nearly undecayed peat, the deeper layers of which consist of carex, forest, or sphagnum peat, or of their mixtures, in decayed form. In partial and total protrusion ground water increased the earth pressure considerably and reduced the consistency of the peat. The principal cause of protrusion is said to be earth pressure.

Part 2 deals with obstruction by materials transported from elsewhere. It was found that earth is transported by the channel water, causing crumbling, rolling, and rolling slips above the water level in mineral soils and breaking off, rolling, and crumbling of peat soils.

Studies of the effect of freezing and thawing showed that these phenomena cause softening and crumbling of the sides of channels and the formation of eaves and projections. They also influence the phenomena of obstruction and erosion. Congelation of surface and subsurface soils was found to soften the sides of channels appreciably for some years after excavation. This action was more intensive in well decayed peaty soils, but comparatively weak in a fibrous peat soil. The vertical and horizontal expansion caused by congelation of soil was found to produce phenomena which break the sides of canals. Congelation was also found to be quite active in crumbling, rolling, and fracture slip, and to intensify the action of erosive phenomena on canals.

The walking of cattle in drained lands was found to form numerous paths on the borders of canals and trenches which may become so deep, if the peat is wet, that the ridge between the path and the channel rolls off into the channel. Apparently no harm was caused to canals in relatively dry swamps.

On level ground vegetation was found to be a very obstructive agency, especially in peat soils, while in clay, silt, and sand soils and in woody fens vegetation was found to consolidate the sides of canals.

With reference to the effect of age it was found that of the phenomena affecting the condition of canals, those resulting from displacement of earth occur as a rule only within two or three years after excavation. The phenomena caused by the motion of water were found to persist longer and to be intense immediately after excavation, but to decrease gradually with years and at last cease. Freezing was found to be persistent, but its action weakened after the second year owing to vegetation. The effect of vegetation was found

Public Roads, [April, 1925] (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 2, pp. 25–44+[2], figs. 19*).—This number of this periodical contains the status of Federal-aid highway construction as of March 31, 1925, and data as to the gasoline tax in 1924, together with the following articles: The Wagon and the Elevating Grader, by J. L. Harrison (see below); Procedure for Testing Subgrade Soils, by J. R. Boyd (see below); Tar Surface Treatment of Gravel Roads, by N. M. Isabella; and Effect of Capping on Strength of Cores Drilled from Concrete Pavements, by R. E. Bergford.

Procedure for testing subgrade soils, J. R. Boyd (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 2, pp. 34–39, 41, figs. 10*).—Descriptions are given of the revised methods for testing subgrade soils as adopted by the Bureau of Public Roads. These include mechanical analysis, moisture equivalent test, capillary moisture test, volumetric shrinkage test, comparative bearing value test, slaking value test, and dye adsorption test. The interpretation of test results is discussed.

The wagon and the elevating grader, J. L. Harrison (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 2, pp. 25–33, 41, figs. 4*).—Studies conducted by the Bureau of Public Roads on the operation of the elevating grader wagon combination and the various factors affecting its production are reported.

It is brought ont that there are comparatively few contractors now operating elevating graders who succeed consistently in obtaining an average output much over 60 loads an hour, and many contractors never consistently reach this output. As compared with this rate of output, however, there is no apparent reason why, by careful attention to the speed at which the grader is moved and the bite that it takes, a load can not be consistently put onto a wagon in 16 seconds and an exchange of wagons made in 5 seconds, which, with due allowance for turns and the elimination of unnecessary delays, should enable an efficient contractor to prodnee a load every 30 seconds, or 120 loads an hour. In order to secure such a rate of production, the principal requirements are an adequate wagon supply and really competent superintendence.

Materials of construction, H. E. Pulver (*New York and London: McGraw-Hill Book Co., Inc., 1922, pp. XVIII+318, figs. 116*).—This is one of the Engineering Education Series prepared for the extension division of the University of Wisconsin. It contains chapters on plasters and natural cements, limes and lime mortars, Portland cement, Portland cement mortars, plain concrete, building stone, brick and other clay products, stone and brick masonry, timber, pig iron, cast iron, wrought iron, steel, special steels and corrosion of iron and steel, nonferrous metals and their alloys, and some miscellaneous materials.

Structural engineering: Fundamental properties of materials, G. F. Swain (*New York and London: McGraw-Hill Book Co., Inc., 1924, pp. VII+200, figs. 49*).—This book deals with the fundamental properties of the principal materials which should be familiar to the engineer. It contains chapters on wood; the constitution, heat treatment, and mechanical treatment of iron and steel; cast iron; wrought iron; malleable cast iron; steel; alloy steels; nonferrous metals and alloys; stone; brick and other clay products; calcareous cement and concrete; and corrosion of metals—paints and varnishes.

Reinforced concrete design, G. P. Manning (*London and New York: Longmans, Green & Co., 1924, pp. XVI+484, pls. 2, figs. 208*).—The purpose of this work is to establish methods for the design of reinforced concrete suitable for use by a practicing engineer. It is divided into three parts.

Part 1 treats of the cross sections of members and the stresses produced, and Part 2 with the question of members as a whole. Part 3 is a discussion of complete structures and contains chapters on design of structures—general

buildings, continuous footings, water towers and reservoirs, bunkers and silos, bridges, retaining walls, chimneys, and first principles.

Results of tests to determine heat conductivity of various materials, C. H. Herter (*Refrig. Engin., 10 (1924), No. 7, pp. 256–280, fig. 1*).—A large amount of tabular data is presented containing numerical values for the rate of heat flow through most of the materials an engineer has to deal with. An attempt has been made to list the various materials approximately in the order of their power to resist heat flow.

It is noted that some of the loose insulating materials show as low a heat conduction as does air alone. This is attributed to the fact that in a filled space the diminished convection and radiation offset the conduction proceeding through the fibers of the insulator. The packing of an air space with insulating material is therefore of particular advantage.

In the absence of a series of tests of each material at various densities it is considered hardly possible to state just which density or rate of packing will result in the least heat conduction. It is noted in this connection that lower heat conduction was obtained with eiderdown at 6.8 lbs. per cubic foot than with 4.92 lbs. because in the latter case there was a better chance for convection. Similar results were obtained with absorbent cotton. The heat conduction of dry granulated cork seemed to depend more upon the state of division and absence of foreign substances than on the greater density, some grades at 3 lbs. per cubic foot showing up as favorably as grades three times as dense.

It is further pointed out that all so-called insulators are more effective per degree of difference at low than at high temperatures, that property being due to radiation in the minute air cells and to included moisture. However, there is no uniform behavior in this respect in metals, the conductivity increasing in one metal and decreasing in another.

Hydro-electric power as a by-product of agricultural storage, E. N. Bryan (*Amer. Soc. Civ. Engin. Proc., 51 (1925), No. 1, [pt. 3], pp. 80–92, figs. 3*).—In a contribution from the Department of Public Works of the State of California, it is pointed out that large blocks of hydroelectric power are becoming available as a by-product in connection with the operation of irrigation storage works. This by-product has certain peculiar characteristics in that (1) it is the result of an advance during the past 25 years in the art of constructing high dams, (2) it is purely a by-product—not an end in itself, but merely an incident to the development of agricultural storage, (3) it has a seasonal distribution strikingly akin to the seasonal distribution of the demand for agricultural power, (4) to date there has been little progress in the provision of standby service, and (5) the producer of this energy is generally immune from regulation in the matter of rates and service.

The ultimate total delivery of power by these by-product plants is considered to be relatively very important. This power supply is adapted especially to the satisfaction of a demand for irrigation pumping. In the case of three large projects with an abundance of water, the proposed ultimate installation is equivalent to that required for an irrigated area of equal size with an average lift of 90 ft. This by-product would therefore appear to open the way for irrigation of lands not heretofore thought susceptible of irrigation because of the cost of power.

The marketing of this by-product is considered to present some unusual and unsolved problems. At least three means of marketing are available, namely, (1) the power might be sold wholesale at the generator switchboard to a utility at a price equivalent to only a relatively small part of the rate paid by actual consumers, (2) the producer may undertake the cost of standby

service, distribution, and collection of accounts, and may then expect a much higher average rate, and (3) the project area may be increased so as to include a demand for a considerable block of the by-product power for irrigation pumping. It is pointed out that neither the cost of producing nor precedent establishes the sale value of such power, and the conditions which govern are not generally understood.

Certain dangers connected with this type of development are mentioned, such as false encouragement of premature and ill-considered irrigation development, the waste of water through low-head power plants along the lower reaches of the river, the destruction of capital by duplication of existing systems, and the lack of some disinterested regulative authority to stand between the producer and consumer in the matter of rates and service.

The relationship of air consumption to brake horse-power in internal-combustion engines, road and flight tests, H. Moss (*Inst. Mech. Engin. [London] Proc., 1924, I, pp. 345–390, figs. 19*).—A description is given of a new air flow meter based on the principle of continuous flow electrical calorimetry. The air consumption is measured by the amount of heat required to raise the temperature of the air through a fixed range of about 1.5° C. (34.7° F.). The heat is supplied by a resistance coil in the form of a mat placed across the intake pipe and heated electrically. The rise in temperature is measured by two resistance thermometers in the form of grids, one on each side of the heating coil and connected differentially. The instrument is attached to the air intake of the engine. The heating current is adjusted till the temperature rise is a fixed amount, and is then measured by the voltage across the heating coil.

Experiments with two different engines showed that the calibration curve of the air flow meter obtained with steady flow held good for a high speed engine. A damping air reservoir of small bulk only was needed in extreme cases to produce identity of steady flow and engine flow calibrations for engines of lower speed and fewer cylinders. The data are taken to indicate that a measure of the air consumption should give the brake horsepower with a possible error of less than 2 per cent.

Determination of dilution of crank-case oil, H. H. Knoch, P. A. Crosby, and R. R. Matthews (*Indus. and Engin. Chem., 16 (1924), No. 11, p. 1153*).—The results of using a vacuum distillation process in two different ways for the determination of crankcase oil dilution are briefly presented.

Guide to agricultural machinery, G. Kühne and E. Meyer (*Leitfaden der Landwirtschaftlichen Maschinenkunde. Berlin: Deut. Landw. Gesell., 1923, 2. rev. ed., pp. VI+122, figs. 237*).—This is the second, revised edition of this publication, which describes the materials used in the manufacture of farm machinery, some of the more important generally applicable mechanical details, and leading examples of the different main types of machines.

Researches on the metals employed in the construction of agricultural machines [trans. title], M. Ringelmann (*Ann. Inst. Natl. Agron., 18 (1924), pp. 205–248, figs. 9*).—A rather detailed description is given of the methods employed by the machine testing station of the National Institute of Agronomy of France in studying and testing the metals used in the construction of agricultural machines. These include wear tests in actual service.

A preliminary investigation into the draft of the plough, W. M. Davies (*Jour. Agr. Sci. [England], 14 (1924), No. 3, pp. 370–406, figs. 16*).—In a contribution from the School of Agriculture, Cambridge, detailed studies on the soil factors influencing the draft of a plow are reported.

The results showed that the state of consolidation resulting from the nature and treatment of the previous crop has a most marked influence on the draft,

causing variations of from 107 to 580 lbs. in gross draft and of from 68 to 483 lbs. in net draft on a typical 2-horse soil, when the force exerted by each horse is about 150 lbs.

The relation between draft and depth of furrow was found to be linear, the net draft per square inch tending to increase in value with increasing depth, except when the previous crop was a root crop, when a decrease at depths greater than from 6 to 8 in. was noticeable. The relation between draft and width of furrow was also linear, the net draft per square inch in some cases showing an increase and in others a decrease with increasing width. Further observations suggested that a greater proportion of the net draft is used in overcoming the resistance of the soil than in turning the furrow.

The quantity of moisture in the soil had a considerable effect on draft. It is thought probable that there is an optimum content from which an increase or a decrease will result in increased draft. In one case measured, a decrease in soil moisture of 6 per cent resulted in an increase in draft of 28 per cent.

The double plow was found to be a more efficient implement than the single plow with similar fittings and moldboard.

Use of headers in Algeria, C. Clarou (*Utilisation des Espicadoras en Algérie. Algiers: Gouvt. Gén. Algérie, Dir. Agr., Com. et Colon., 1921, pp. 32, pls. 4, figs. 6*).—A description is given of the use of headers in the harvesting of grain in Algeria, which includes a brief outline of the mechanical details of the machines used and their manner of operation.

Painting on the farm, H. P. Holman (*U. S. Dept. Agr., Farmers' Bul. 1452 (1925), pp. II+33*).—This supersedes Farmers' Bulletin 474 (E. S. R., 28, p. 386). It describes various kinds of paint and gives practical information on the selection, mixing, and application of paint and for making and applying several kinds of whitewash.

The preservative treatment of fence-posts (*Canada Dept. Int., Forestry Branch Circ. 16 (1924), pp. 4*).—Brief information on the treating of fence posts primarily by creosoting is presented.

American Society of Heating and Ventilating Engineers Guide, 1923 (*New York: Amer. Soc. Heating and Ventilating Engin., 1923, pp. [5]+399, pl. 1, figs. 88*).—This guide contains reference and design data useful in the planning and construction of modern heating and ventilating installations, the results of investigations from the research laboratory of the society, and a catalogue and reference data section containing essential and reliable facts concerning modern equipment. The roll of membership of the society is also included.

The insulation of roofs to prevent heat loss and condensation, W. L. Miller (*Heating and Ventilating Mag., 22 (1925), No. 1, pp. 49–51, 67, fig. 1*).—Data are presented on the subject, together with a chart for figuring in one operation the necessary roof resistance for any humidity to prevent condensation.

Construction and management of the bank storage cellar, L. M. Marble and R. D. Anthony (*Pennsylvania Sta. Bul. 191 (1925), pp. 3–32, figs. 16*).—The first part of this bulletin deals with the principles of construction of storage cellars, with particular reference to the storage requirements of such crops as apples, and gives drawings, specifications, and bills of materials for typical structures. The second part reports the results of experiments in ventilating the bank storage cellar and describes their practical application.

Home-made labor saving devices for the hog farm, J. C. Wooley (*Missouri Sta. Circ. 131 (1924), pp. 12, figs. 21*).—Descriptions, drawings, and bills of materials for a self-feeder, self-feeder for roughage, hog trough, shipping

crate, loading chute, ringing chute, herding gate, frost-proof drinking fountain, movable waterer, concrete hog wallow, vaccinating trough, and rubbing post are given.

Washington poultry houses, J. S. Carver, G. R. Shoup, W. D. Buchanan, and L. J. Smith (*Washington Col. Sta. Bul. 188 (1925), pp. 6–88, figs. 46*).—Practical information and drawings for poultry houses and their accessories which are adapted to Washington conditions are presented.

On abundance and diversity in the protozoan fauna of a sewage "filter," W. J. Crozier (*Science, 58 (1923), No. 1508, pp. 424, 425, figs. 2*).—Studies conducted at the New Jersey Experiment Stations are reported which showed that in the film of organisms and débris retained among the broken stones of a sewage purification filter, ciliate and rhizopod protozoans showed seasonal variation in abundance of individuals and a directly correlated fluctuation in diversity of their types. An inverse correlation was recognized in natural environments of greater selective stringency. It is thought that such relationships may provide a basis for comparing the selective potentials of different environments.

Are microscopic animals a factor in the foaming of Imhoff tanks? J. B. Lackey (*Pub. Works, 56 (1925), No. 1, pp. 6, 7, figs. 2*).—Studies conducted at the New Jersey Experiment Stations are briefly reported, the results of which are said to show that when a tank is functioning well there are but few protozoa in it, but that when a tank foams the numbers have been known to increase to 250,000 small flagellates and 20,000 small ciliates per cubic centimeter. Most of these protozoa have been found to attack the sewage directly or to live on material released in the processes of decomposition. Very few of them subsist on the bacteria which are present.

A comparison by sizes and numbers of protozoa and bacteria shows that the protozoa in a cubic centimeter are comparable to 122,000,000 bacteria, and in a tank which was foaming the numbers of bacteria per cubic centimeter were shown to vary from 4,000,000 to 300,000,000. This is taken to indicate that the protozoa may more than equal the bacteria when the volumes of the two are compared.

Sewage analysis and its interpretations, F. W. Mohlman (*Amer. Jour. Pub. Health, 15 (1925), No. 1, pp. 10–16, fig. 1*).—Studies are briefly reported, the results of which are taken to indicate that the most valuable determinations available in sewage work are the biochemical oxygen demand and ammonia plus organic nitrogen. There is said to be a real need for the use of these determinations in analyses of sewages from widely differing sources, and the compilation of more per capita factors than are now available.

The dilution method for determining oxygen demand is considered to be still far from perfect, and to require more work on the influence of various types of diluting water, on the rate of depletion at various temperatures, and on the relation of the dilution method to the nitrate method.

RURAL ECONOMICS AND SOCIOLOGY

Agricultural economics: A selected list of references, compiled by M. G. Lacy (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 1 (1925), pp. 11*).—A mimeographed selected list of references on general economics, agricultural economics, cooperation, credit, farm management, land tenure, marketing, and rural sociology is presented.

The agricultural situation in the United States, edited by C. L. King et al. (*Ann. Amer. Acad. Polit. and Social Sci., 117 (1925), No. 206, pp. V+304, figs. 22*).—This number is devoted to the subject of the position of

American agriculture in the postwar period. It contains the following papers: The Farm Income Situation, by R. J. McFall; The Purchasing Power of the Farmer's Dollar from 1913 to Date, by A. B. Genung; and Income from Agricultural Production, by L. H. Bean and O. C. Stine, included in part 1 on the subject of the farmer's dollar; Interest and Taxes in Relation to Farm Income, by L. M. Graves; Taxes in Relation to Earnings of Farm Real Estate, by C. O. Brannen; The Trend in Land Values and Land Utilization, by G. S. Wehrwein; Migration to and from Our Farms, by C. L. Stewart; The Trend in Tenancy and Ownership, by A. M. Loomis; and Agricultural Credit Facilities—Are They Ample? by A. D. Welton, constituting part 2 on taxes, tenancy, credit, and farm ownership; and Farmers as Managers, by W. M. Jardine; The Services of American Agricultural Colleges, by A. C. True; Crop Insurance: Its Recent Accomplishments and Its Possibilities, by G. W. Hoffman; The Agricultural Situation as Viewed by a Western Senator, by A. Capper; and A National Agricultural Program, by H. C. Wallace, constituting part 3, which discusses farmers as managers. Part 4 on the market for farm products and the cost of marketing contains The Farmer's Foreign Market, by R. J. McFall: A Domestic Market for American Farm Products, by L. C. Gray; The American Farmer and the Tariff, by C. W. Holman; Measuring the Spread from Farmer to Consumer, by W. P. Hedden; and Costs and Margins in Marketing, by J. D. Black and H. B. Price; part 5 on self-help through cooperative organizations, The Extent of Cooperative Marketing among Farmers Today and the Result Secured by Cooperative Associations, by B. H. Hibbard; Financial Gains of Marketing Successfully through Cooperation, by T. Macklin; Possibilities and Limitations of Cooperative Marketing, by H. E. Erdman; Sound Principles in Cooperative Legislation, by J. D. Miller; and Marketing Fluid Milk in Philadelphia; An Experience in Sales Cooperation, by R. W. Balderston; and part 6 on fitting production to the market, Supply and Price Interactions in Farm and City Products, by H. A. Wallace; Fitting Production to the Market, by R. J. McFall; The Place of Advertising in American Agriculture, by G. F. Johnson; Scientific Nutrition and the Farm Output, by E. V. McCollum; Fertilizer Use in the United States, by S. B. Haskell; Extending Farm Diversification Westward and Northwestward into the Great Plains Region and the Spring Wheat Area, by J. L. Coulter; The Relation of Local Farm Output to the Local Product, by J. M. McKee; and A Balanced Agricultural Output in the United States, by W. J. Spillman.

The economic future of our agriculture, C. L. Holmes (*Jour. Polit. Econ., 32 (1924), No. 5, pp. 505–525*).—The agricultural depression is said to be due primarily to certain more or less permanent results of the World War, which expanded our agricultural output, impaired our foreign market for agricultural products, and redirected the currents and content of our international trade; and the recovery of the agricultural industry is held to depend upon the adjustment of agricultural production, both qualitatively and quantitatively, to the demostic market. The new foreign market situation is characterized by the reversal of the debt balance between the United States and Europe. When payments of interest and principal begin to be made in merchandise there will come about an excess of imports over exports. Europe will buy food and raw materials in cheaper markets than will be afforded in the United States, and purchases in the United States will consist largely of industrial products. The expansion of the nonagricultural industrial output in the United States is predicted in view of the fact that there is an ample supply of financial capital, capital goods, and raw materials. The labor supply remains the limiting factor, but it is held that organized labor may be brought by necessity to relax its con-

trol of wages, employment, and production output. With industrial expansion will come the development of the home market for agricultural products. The first step recommended in the adjustment of agriculture to the present situation and to the immediate future is the substantial reduction of the production of staples, especially wheat and pork, the substitution of higher-priced products, and the abandonment of some of the poorest land now in use.

International agricultural problems, E. Laur (*Jour. Farm Econ., 6 (1924), No. 2, pp. 196–211*).—A number of these are discussed.

With regard to the problem of land tenure, three theses are drawn up to the effect that (a) it is not practical for the Government to undertake farming operations on a large scale, (b) it is in the interest of national economy to increase the number of individual farmers, and (c) the transition from a régime of large estates to that of small farms must be carried out with great prudence. It is regretted that the International Labor Bureau has been declared competent to regulate hours in agriculture. The collaboration of farmers of all countries in the publication of international statistics of the production, commerce, trade, and prices of all the raw products which they use is urged, as is also the establishment of international organizations for the study and forecasting of market prices and for regulating production in accordance with demand and the market situation. The question of the limiting of interest rates is also held to be an international problem.

The law of diminishing returns, W. J. Spillman and E. Lang (*Yonkers, N. Y.: World Book Co., 1924, pp. XI+178, figs. 16*).—In part 1 of this treatise it is shown that the law of the diminishing increment is confirmed by experiments with fertilizers and with irrigation water in the United States and that it applies to the growth of fattening animals and to the growth of children. A method of evaluating the contents of the equation for the diminishing increment by means of the principle of least squares is also given. Part 2 is a translation, by the author of part 1, of an article by Lang previously noted (E. S. R., 45, p. 329).

An economy study of negro farmers as owners, tenants, and croppers, D. D. Scarborough (*Ga. Univ. Bul. 376 (1924), pp. 37, figs. 27*).—A house to house canvass was made among negro farmers in Clarke, Oconee, Wilkes, and Cobb Counties, Ga., and 87 records for 1922 were obtained which were considered usable. The information gained therein has been summarized, data from farm management surveys in Sumter County, Ga., and from recent censuses being cited for earlier years.

The colored population in these counties averaged 46 per cent of the total. Twenty-one negro landowners were visited, nine of whom had inherited their land. In the majority of the 12 cases where an individual had bought his land the purchase had been made possible with the aid of a white person. Approximately one-half of the land owned by negroes in the sections studied was in woods, pasture, and waste. The average working capital per farm was found to be $365.30 for owners, $235.80 for renters, and $75.70 for croppers.

Of the crop land noted in the survey 42.5 per cent was planted in cotton, 43 in corn, 7.2 in small grains, and 7.3 per cent in other crops. Very little diversification was practiced under any form of tenure. The average application of fertilizers was 107 lbs. per acre. Receipts from the sale of cotton formed 44.7 per cent of the total crop receipts of owners, 57.9 of renters, and 66.6 per cent of croppers. The total value of the family living per family of five in 1922 was found to be $447.10. On cropper farms 40.2 per cent of the family living came from the farms and on owner farms 54.2 per cent.

Croppers made lower yields than renters and owners with crops other than cotton. Rents on the whole were found to be high.

The economic and social importance of the time lease in German agriculture [trans. title], M. SERING (*Ber. Landw. Reichsmin. Ernähr. u. Landw. [Germany], n. ser., 1 (1924), No. 3–4, pp. 3–84*).—Summaries of the information gathered from the replies to a long and detailed questionnaire, covering the characteristics of ownership and business conditions in agriculture, the characteristics of the leasing system, and the effects of the lease in agriculture and asking for suggestions as to the reforms that are deemed necessary, are published in two parts. The first, by R. Seiff (pp. 9–45), covers the small-farmer territory, including the Rhine Province with the exception of Düsseldorf, Wiesbaden, Hesse, Baden, western Wurttemberg, Lower and a part of Upper Franconia, and Thuringia. The second part, by C. von Dietze (pp. 47–84), covers Germany east of the Elbe.

Land reform in Ireland, J. I. FALCONER (*Jour. Farm Econ., 6 (1924), No. 4, pp. 344–350*).—This subject is discussed under the heads of fixing judicial rents, converting tenants to owners, and the enlarging of small holdings. The laws that have been passed and the progress achieved since about 1885 are briefly surveyed.

Truck-farm labor in New Jersey, 1922, J. C. FOLSOM (*U. S. Dept. Agr. Bul. 1285 (1925), pp. 38, figs. 12*).—A party of field workers carried on a study in the truck-farming district of New Jersey in the summer of 1922 in order to determine the conditions of agricultural employment, the best methods of obtaining and keeping a good class of laborers, opportunities for other employment during the dull season, and characteristics of farm laborers. To the schedules for employers 375 and to those for employees 683 usable replies were obtained, and information from various supplementary sources was also taken into consideration.

Only one-half of the farmers reporting hired labor all the year. Nine-tenths of them hired workers at some time other than harvest and all of them at harvest time. The manager of one large farm was paying 25 cts. per day less than other employers, but he was offering steady work and providing somewhat better than the average living accommodations. The majority of farmers reported little or no trouble in obtaining workers.

Of the farm employees interviewed, 497 were American born. Three-fifths of them were farm bred. Over one-half the native born had had five or more grades of grammar school work, and one-third of the foreign born had attended school in their native lands from five to nine years. Of the 140 minors of school age, only 58 were making normal progress or better for their ages.

The average money receipts from all sources by all workers reporting averaged slightly less than $600 for the year. The foreign born earned on the average $120 more than the native-born worker. Three persons in 10 who reported had no savings, one-half had life insurance, and one-third had savings accounts.

Farming working conditions are reported under the heads of wages, perquisites, living conditions, and recreation and social standing, and suggestions are offered for the improvement of the farm labor situation.

The Bank of North Dakota: An experiment in agrarian banking, A. S. TOSTLEBE (*Thesis, Columbia Univ., New York, 1924, pp. 211*).—The purpose of this monograph is to describe the merits and defects of the Bank of North Dakota as they have been revealed after four years of operation. Chapters 1 and 2 set forth the agricultural and politico-economic conditions in the State which called forth the experiment. Chapter 3 is given to a discussion of the salient features of the laws creating the bank and providing for its organiza-

tion and operation. The following chapter is given to the question of the bank's relation to the existing credit structure. The operation of the bank from the time of its organization to November 2, 1921, is then treated in approximately one-third of the whole study.

The policy of the bank officials in determining to return public funds to their place of origin and in exceptional cases to favor countries of lesser financial strength is commended. In the matter of loans and discounts to local banks, the bank is held not to have had a faultless record of impartiality or of business sagacity. No irregularities in the making of loans to individuals on warehouse receipts are to be found. The absence of a law requiring a reasonable reserve is held to be perhaps largely responsible for many of the difficulties that the bank encountered. The fact that it did not show a profit is to be explained in the losses sustained through unwise loans and redeposits.

Political enemies of the Nonpartisan League and any institutions allied with it took advantage of the deflation period in 1921 to make the bank unpopular. The public fund law initiated on November 2, 1920, made possible the deposit of public funds of various counties, townships, school districts, cities, and villages in any and all State and national banks. This permitted the removal from the Bank of North Dakota of its largest and most reliable deposits, and between January 15 and February 16 of the new year they decreased by nearly 27 per cent. The recall election of October 28, 1921, established the Independent Party in power, and the change in the bank's administration took place just as it had passed a crisis and its condition was improving.

The Independent administration gave particular attention to the development of a farm loan business. The operations of this department in 1922 were, however, unwarrantedly slow, and careful observers, both in North Dakota and elsewhere, are said to have concluded that the Independent administration had as its aim the discredit, sabotage, and destruction of the bank.

In conclusion the bank is criticized from the standpoint of five principles upon which it was established. The first was the widespread belief held in North Dakota that existing banking systems were utterly inadequate, and the second was that the new banking machinery should take the form of a State bank and that public money should be an important factor in its operation. In the next place it was thought that by means of a central reserve bank the entire financial resources of the State would be mobilized to the best advantage, but it is held to be doubtful whether the North Dakota credit problem was brought much nearer to solution in this way. Since the State has but one main industry and the seasonal credit requirements are the same throughout the State, funds can not be transferred from one section without depriving another section of money needed for the same purpose. The fourth principle, that of the fusion of mortgage banking with reserve banking, is deemed one of the most ill-advised concepts that entered into the structure, and lastly the control was vested in a body composed of State officials who held their offices by virtue of popular political election.

Two changes are suggested, the first and most important being the revision of the bank act so that administrative officers may not use the law to further their own political ends, and the second the placing of the control of the bank in a body other than the industrial commission.

Appendixes set forth the activities of the Federal land bank, joint stock land banks, and the War Finance Corporation in North Dakota.

Advertising farm products by farmers and farm organizations, A. H. Benton (*North Dakota Sta. Bul. 185 (1925), pp. 5–32, pls. 16, figs. 6*).—Prac-

tical suggestions are offered and numerous posters, newspaper classified and display advertisements, farm business letterheads, billboard designs and slogans, and community and national trade-mark or brand advertisements are illustrated.

Marketing cotton for export, E. L. TUTT and W. R. MEADOWS (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 288 (1924), pp. II+45*).—It is intended to show how foreign shipments of cotton from the United States are handled and financed from the time they leave the hands of the growers until they arrive at the mills. Methods of handling domestic shipments are also discussed.

Certain changes from pre-war methods are noted. The principal one is said to be that whereas many European consumers formerly purchased heavy supplies in the fall and carried them through the season until needed for spinning, they are now buying on a hand-to-mouth basis and Americans are performing the services of warehousing, insuring, and financing, which before the war were performed in Europe. Furthermore, exporters now buy and later find a market for their stocks, making it necessary for them to finance the transaction up to or beyond the foreign port. The foreign buyer places his order with the exporter quoting the lowest price, and the larger part of the export business is said to be done on the so-called mill's call.

Considerable importance is attached to the facility for shipment on regularly established Shipping Board steamship routes to ports to which only irregular sailings could be had before the war. The practice has grown up among American exporters of consigning cotton to Europe and holding it in storage in the ports to meet the demands from the spinners. The exporter then uses an American bank, generally one in New York, to finance his transaction. Following this development it became necessary that the cotton be insured in dollars, and American companies began to enter the insurance field. The revival of the War Finance Corporation to make advances to finance the carrying of stocks of American cotton in foreign warehouses, as well as on cotton stored in the United States under contract for sale abroad, is noted in this connection.

Finally, the question of cooperative marketing is discussed, presenting first the opinions of members of other agencies of the cotton trade with regard to the cooperative associations, and second a description of the organization and operation of cooperative associations coordinated into the American Cotton Growers' Exchange.

Avoidable losses in cotton handling (*U. S. Dept. Agr., Bur. Agr. Econ., 1925, pp. 59*).—This is a stenographic transcript, in multigraphed form, of the proceedings of a conference held in the Bureau of Agricultural Economics, February 24, 1925.

Shipments and unloads of certain fruits and vegetables, 1918–1923 (*U. S. Dept. Agr., Statis. Bul. 7 (1925), pp. 110*).—The statistics presented in 29 tables in this bulletin show the shipments by States of origin of apples, cabbage, cantaloupes, celery, onions, peaches, potatoes, strawberries, and tomatoes and the car-lot unloads of these commodities in the markets of New York, Chicago, Philadelphia, Pittsburgh, St. Louis, Cincinnati, St. Paul, Minneapolis, Kansas City, Washington, Cleveland, and Detroit. The material was prepared for publication under the direction of E. W. Stillwell and L. B. Flohr.

Hay and feed statistics (*U. S. Dept. Agr., Statis. Bul. 11 (1925), pp. 114*).—Statistics are presented showing the acreage, yield per acre, production, stocks, trade movements, receipts, and shipments of hay, and prices and freight rates of hay and feed, for the year ended December 31, 1924, with comparable data

for earlier years. They were prepared under the direction of J. J. Window, J. A. Hodgkins, and L. B. Flohr.

The measurement of freight rates, H. S. Gabriel (*Jour. Farm Econ., 6 (1924), No. 4, pp. 360-366*).—Three methods of measurement being used at present, including index numbers of revenue per ton-mile, index numbers of the percentage changes, and index numbers of actual freight rates, are discussed here. The first two are criticized for certain inaccuracies, while the third is recommended as seeming to eliminate most of them without having serious limitations of its own.

Price spreads: A selected list of references relating to analyses of the portion of the consumer's price accruing to various agencies, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 4 (1925), pp. 20*).—This is a selected list, in multigraphed form, of references on this subject.

Market price analysis, W. C. Waite (*Jour. Farm Econ., 6 (1924), No. 4, pp. 351-359*).—The author reports having made a preliminary study of three of the central markets for agricultural products in Minneapolis and St. Paul. His examination is said to have indicated that the usual price analysis is deficient in certain important aspects.

In the first place it presupposes a condition under which producers and consumers deal directly with one another. The majority of the transactions actually take place, however, with intermediaries between the producer and consumer on at least one side, and in the central markets largely between the intermediaries alone. Under this condition the utility of goods ceases to be a consideration operating on the buying side.

In the second place the dealer's demand schedule is a derivation of his consumers' demand schedules plus considerations of cost which are influenced by volume and turnover. It is pointed out that prices in the market are not determined by what one might call the real or ultimate facts of demand and supply but rather by the opinions of those in the market with regard to these ultimate facts. Dealers in the central market are endeavoring to estimate certain factors, such as the total stock of goods that will be available for the market during the season, the rate of flow of the goods to the market, and the price at which consumers will take the stock and what the variations of demand will be at different periods of time.

There are said to be two sets of prices ruling in the actual markets, one the range of prices prevailing over the market at a particular time for products of the same kind and the other the succession of prices prevailing from time to time. Research into these phases of price theory as the next development in the study of marketing is urged.

Elasticity of supply of farm products, J. D. Black (*Jour. Farm Econ., 6 (1924), No. 2, pp. 145-155, figs. 2*).—Several methods of attack of the problem of determining the relation between price and subsequent output, or the elasticity of supply, are noted critically, especially that method involving the bulk line concept. A case is presented for the statistical method, granting a number of very great difficulties involved, particularly in the way of measuring the variables. A multiple correlation analysis is held to be generally applicable. Progress is being shown by work carried on at the University of Minnesota, in that statistical measures are being obtained for most of the important variables and the duration of price changes and the time of response are being taken into account. Surprisingly high correlations are noted. It is suggested that some of the objects of such analysis must be the application of data in connection with the control of output proposals on the part of centralized cooperatives, also in the effort on the part of public agencies to deter-

mine whether cooperative organizations have unduly enhanced the prices of commodities. Results are needed also for any real solution of the tariff problem.

Distribution of agricultural exports from the United States, H. M. STRONG (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 177 (1924), pp. IV+42, figs. 16*).—This bulletin is a preliminary summary of the outstanding facts shown by itemized statistics compiled by grand divisions and for the principal importing countries, indicating the destination of our agricultural products. These statistics have been compiled for the calendar years since 1915. Only unmanufactured and primary manufactured products have been included, omitting the exports of alcoholic liquors and beverages.

Comparing the averages for the periods 1910–1914 and 1920–1922, cotton and bread grains are found to continue to occupy first and second places, respectively. Cotton leaving the United States has declined from nearly 4,500,000,000 lbs. to less than 3,250,000,000 lbs. Sugar exports show a marked increase both in percentage and in value, and tobacco has doubled in the percentage which it forms of total agricultural exports but has quadrupled in value.

It is pointed out that 80 per cent of the surplus from the farms of the United States goes to Europe alone. The other countries of North America, chief among which are Canada and Cuba, use 10 per cent; Asia and South America a little over 3 and 1 per cent, respectively; and Oceania and Africa each less than 1 per cent of all agricultural exports. Eastern Asia and eastern United States are said to be future food-buying regions of importance.

Five regions whose products compete with agricultural exports from the United States in the markets of northwest Europe are discussed, namely, the prairie provinces of Canada, the River Plate region and adjacent areas of Argentina and Uruguay, Russia, the plateaus and northwestern part of India, and southeastern Australia. The surplus of food for export from Canada will doubtless continue large, and Russia will return to her position as an exporter of wheat. At present Argentina is the strongest world factor in the world markets for corn, beef, and beef products. British India will export some of its wheat and cotton, but the large and dense population will utilize most of the crops. Australia will continue to have a proportionately large surplus of wheat, beef, and dairy products, because its population will not be large.

Transportation in relation to the export trade in agricultural products, R. M. KRAMER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 216 (1924), pp. II+74, figs. 3*).—The routing of export shipments of wheat, cotton, unmanufactured tobacco, flour, meats, and cottonseed oil is described, giving the principal ports shipping them and the principal foreign markets for which they are destined. Railroad equipment, services, and privileges; the principal inland water routes; and terminal facilities and charges are described. The principal conference agreements at present existing and the purposes of each are briefly outlined. Ocean bills of lading and ocean charters are described as the forms of contracts of carriage under which agricultural products are carried abroad, and finally the principles entering into the making of rail and water freight rates on the specific commodities under consideration are summarized.

International trade in raw silk, L. A. WHEELER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 283 (1924), pp. II+17*).—Statistics from the Census of Manufactures of the United States bring out the fact that between 1909 and 1919 the silk industry showed a remarkably rapid growth. The information presented in tables in this bulletin indicates the chief raw

silk producing countries, the principal international movement of the fiber and of silk manufactures with particular reference to the raw silk import trade of the United States, and the leading silk consuming countries.

International trade in wool, L. A. Wheeler (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 301 (1925), pp. II+70, figs. 5*).—It is estimated that the world's total wool production had fallen off in 1923 approximately 17 per cent from the pre-war average. In post-war years there were about 14 per cent fewer sheep in the world, the principal decreases being noted in Uruguay, Argentina, the United States, and Australia. Spain is said to be the only country showing an appreciable increase. It is thought, however, that there has been a presumptive gain of about 1,000,000 sheep in Africa during the past decade. The principal wool-producing countries and their exports are described and tabulated.

As regards importing countries only one change is noted as between pre-war and post-war periods, which is that the United States has displaced Germany as the third largest net importer of wool.

In conclusion it is held that a considerable increase in the production of fine wool is to be expected in British South Africa. No permanent increase in wool production is to be expected in Argentina in the face of increasing competition from agriculture and cattle raising. The same situation is found in Uruguay. The United States must look to foreign countries for over 50 per cent of its supply if the present rate of consumption is to be maintained.

International trade in the minor fibers, L. A. Wheeler (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 289 (1924), pp. II+12*).—A brief review is presented with tabulated statistics from official sources, showing the exports from the principal producing countries and the amounts taken by importing countries of jute; manila hemp; kapok; henequen, sisal, and istle; and flax, phormium, and hemp.

Agricultural law: The Agricultural Holdings (Scotland) Act, 1923, the ground game acts, and other acts, I. Connell (*Edinburgh: William Hodge & Co., Ltd., 1923, pp. XVI+447*).—This volume contains the texts of these laws, with annotations, and seven appendixes are added giving parts of related legislation, forms, and other matters.

The international agrarian crisis, M. Sering (*Jour. Farm Econ., 6 (1924), No. 4, pp. 313–343, figs. 14*).—A wholly abnormal price structure is said to have existed since the close of the war throughout the entire Temperate Zone, and this condition is held to be the immediate general cause of the agrarian crisis. Attention is directed to the relative price movement, and causes for the altered price relation are suggested. The difference between the price received by the producer and that paid by the consumer has increased extraordinarily since 1921, as compared with pre-war relation. The industrial worker obtained in the United States and in England, and possibly in many other countries, a powerful position at a pace which the farmer and farm laborer did not achieve. Great monopolies in raw materials, finished manufactures, and transportation have dictated prices to the whole world. The protective tariff wave benefited industry more than agriculture, and finally the lesser elasticity of agricultural as compared with industrial production must be taken into consideration.

Complete price pressure has affected only commodities participating in international trade. It is found that there can not be a question of flooding the world's grain markets. The cause of dislocation is found not in supply but in demand, particularly in the greatly diminished purchasing power of western and central Europe, the collapse of central Europe being held to have sympathetically affected all countries of the world to the degree to which

they participated in international industrial intercourse. The revision of the Versailles Peace Treaty in the interest of Germany is called for.

The principles of peasant industry, A. Tschajanow [Chaĭânov] (*Die Lehre von der Bäuerlichen Wirtschaft. Berlin: Paul Parey, 1923, pp. [3]+132, figs. 44*).—A Russian study of the theory of family industry in agriculture has been translated into German by F. Schlömer with the assistance of the author.

On the basis of local agrarian statistics collected by the Zemstvos for the various districts of prerevolutionary Russia, a statistical analysis of the family system economy in agriculture, excluding all wage earners, has been made, one of the aims being to explain why and how the peasant small holding is able to displace the old estate agriculture. The increasing prominence of the peasant family in the life of the nation, its economic self-assertion, the strengthening of the peasant's position as a result of greater profit getting and the effect of profit getting on the family economy, the tendency to supplement the family income by part-time employment in industry, the peculiar rôle of capital under the family system, the position of the peasant class in the social organization as a whole, and its new economic rôle are treated in detail.

The woman on the farm, M. M. Atkeson (*New York and London: Century Co., 1924, pp. IX+331*).—The work, the problems, and the point of view of the American farm woman are set forth here in chapters on the American farm woman, the farm home, the farmhouse, the grounds and gardens, the home business, the woman herself, the boy and the girl, the school, the church, books and libraries, the community, social life, politics and national organization, and the truth about country life. Recent surveys and field studies of rural conditions and rural home problems are cited incidentally, as are also the opinions of many farm women whose correspondence the author has reviewed. Concrete practical suggestions are offered with reference to planning, building, and decorating the farm home and influencing the educational, social, and religious life of the community. The appendix (pp. 321–331) contains a suggestive list of books and bulletins.

Cost of living in farming communities of Iowa, Ohio, and Alabama (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 19 (1924), No. 6, pp. 37–39*).—An abstract is given of three mimeographed preliminary reports issued by the U. S. Department of Agriculture dealing with living conditions and the cost of living among farm families in sections of these States, representing in general the years 1922 and 1923.

Farmers' cooperative associations in the United States (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 20 (1925), No. 1, pp. 178–180*).—An abstract of preliminary mimeographed reports by the U. S. Department of Agriculture on cooperative cheese factories and livestock marketing organizations, respectively, in the United States in 1924 is presented here.

The Co-operation, Community Settlement, and Credit Act, H. A. Smith (*Agr. Gaz. N. S. Wales, 35 (1924), No. 9, pp. 633–638*).—The scope and principal provisions of an act of 1923 intended to provide an adequate statutory basis for the organization of cooperative societies in New South Wales are reviewed here.

A beginning of a bibliography of the literature of rural life, compiled by M. G. Lacy (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 3 (1925), pp. 20*).—This is in multigraphed form, and lists selected classical writings; biography, autobiography, and history; essays, old and new; poetry; fiction; some studies and bibliographies in the field of rural sociology; and a few miscellaneous publications.

Wisconsin agricultural statistics for 1922 and 1923.—Biennial crop and live stock review, P. O. NYHUS (*Wis. Dept. Agr. Bul. 65 [1924], pp. 72, figs. 70*).—This publication reviews crop and livestock statistics for the two later years, continuing the series previously noted (E. S. R., 50, p. 894).

AGRICULTURAL EDUCATION

List of workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1924–1925, M. A. AGNEW (*U. S. Dept. Agr., Misc. Circ. 34 (1925), pp. III+96*).—This list, compiled with the assistance of B. T. Richardson, shows the members of the faculty and staff of the State agricultural colleges and experiment stations who are engaged in teaching, investigation, or demonstration in agriculture or home economics.

Agricultural education, C. H. LANE (*Fed. Bd. Vocat. Ed. Bul. 13, rev. ed. (1925), pp. VII+58*).—The general conditions of the Federal Vocational Education Act as they relate to agriculture and its specific provisions for teacher training are set forth. Revising the bulletin previously noted (E. S. R., 39, p. 194), this brings up to date information with reference to the administrative policies of the Federal Board and presents suggestions concerning the organization and administration of State programs in the field of agricultural education.

Agricultural education (*[Gt. Brit.] Development Commrs. Rpt., 14 (1924), pp. 92–97*).—A report is made of the grants of funds to institutions in England and Wales in 1923–24, principally for extension teaching of agriculture.

Cooperative extension work, 1923 (*U. S. Dept. Agr., Coop. Ext. Work, 1923, pp. 104, figs. 23*).—Some of the outstanding developments of the year in extension work were the increased number of demonstrations to show how to grow at a profit good crops of cotton under boll weevil conditions, also demonstrations in the establishment of permanent pastures in the South, emphasis on diversification in the Northwestern States resulting in more pastures, livestock, and flax, and less wheat, extension teaching of the growing of legumes in both Southern and Northern States, and increased extension activities in dairying and poultry production. The proper nutrition of the farm family was emphasized throughout the country. Marked improvement of working conditions in the farm home and consistent progress in developing sources of farm home income are noted. Four regional conferences were held for the purpose of improving programs of extension work.

National activities and results are reported under the heads of the various crop, livestock, and other agricultural products affected and rural interests. Summaries are also given by sections. Pages 74–104 are devoted to statistical tables.

Adapting nutrition work to a community, L. H. GILLETT (*N. Y. Assoc. Improving Conditions of Poor Pub. 134 (1924), pp. 59, figs. 6*).—Intensive, group, and general methods by which a health education program is being carried out in a health center in a congested Italian district in New York City are set forth. An outline including 12 lessons for health classes is presented by G. Preische and E. Elliott (pp. 35–50).

Outline for a laboratory course in genetics, W. E. CASTLE (*Cambridge: Harvard Univ. Press, 1924, pp. [4]+33*).—This is a guide for laboratory work in genetics, designed to be used in conjunction with the book Genetics and Eugenics (E. S. R., 52, p. 822) by Castle. Tables showing probable errors are appended.

Selected list of Government publications on textiles and clothing, compiled by R. Van Deman (*U. S. Dept. Agr., Bur. Home Econ., 1925, pp. 13*).—About 50 publications representing the work of various Federal bureaus are listed under subject-matter headings.

MISCELLANEOUS

Thirty-sixth Annual Report of the [Connecticut] Storrs Agricultural Experiment Station, [1924], W. L. Slate, jr., et al. (*Connecticut Storrs Sta. Rpt. 1924, pp. VII+396, figs. 99*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, a report of the director, and reprints of Bulletins 116–124, previously noted.

Thirty-seventh Annual Report [of Georgia Station], 1924, H. P. Stuckey (*Georgia Sta. Rpt. 1924, pp. 59–89, figs. 10*).—This contains the organization list, a report by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1924. The experimental work reported is for the most part abstracted elsewhere in this issue.

The Minnesota Agricultural Experiment Station (*Minnesota Sta. [Pamphlet], 1925, pp. [32], figs. 53*).—A popular account of the station's accomplishments, plentifully illustrated.

Report [of] South Mississippi Branch Experiment Station, 1922, 1923, and 1924, E. B. Ferris et al. (*Mississippi Sta. Bul. 225 (1924), pp. 19, figs. 2*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Laws applicable to the United States Department of Agriculture, 1923, compiled by O. H. Gates (*U. S. Dept. Agr., 1924, pp. V+897*).—This supersedes the work previously noted (E. S. R., 41, p. 99), embracing acts and provisions of a permanent character in force on March 4, 1923.

NOTES

California University and Station.—Experimental work has been discontinued at the Mountain View Substation, and a field station for the investigation of diseases of deciduous fruits will be established in San Jose.

A scholarship in the College of Agriculture has been established by the California and Southwestern States Ice Cream Manufacturers Association for the purpose of carrying on studies in the manufacture of ice cream. Fred W. Milner has been selected to take charge of this work.

Dr. H. F. Holst has been appointed instructor in poultry husbandry and junior poultry husbandman, effective July 1.

Science notes that Dr. C. B. Lipman, professor of plant nutrition, has been appointed professor of plant physiology and dean of the graduate division.

Missouri Poultry Station.—The department of pathology and hygiene is issuing *Avian Pathology*, a monthly mimeographed sheet discussing common diseases of poultry and their treatment.

New York State Station.—Representatives of several of the leading milk and dairy products companies of the State met recently at the station with representatives of the Department of Farms and Markets, the College of Agriculture, and the station to discuss the desirability of State supervision over analysts making bacterial counts of milk, particularly where the counts are employed as a basis of payment to the farmer. Three companies reported that they were examining each year several hundred thousand samples of milk as delivered by dairymen, while others reported samples running into tens of thousands. These bacterial counts are frequently being used as a basis of payment to the dairy farmer, and the results secured in the bacterial counts determine the payment or nonpayment of hundreds of thousands of dollars annually to dairymen. It was the consensus of opinion of those present that the State should exercise some supervision over this work, as is now done in the case of the analysis for milk fat, by licensing all analysts who make bacteriological examinations of milk in order that the dairy farmer may be protected from careless or fraudulent analytical work.

A report was also made to the conference on the progress being made in the standardization of the glassware used in making bacterial counts in milk. Two years ago State legislation was enacted for the examination of all glassware used for this purpose in a similar manner to the supervision given glassware used in making butterfat determinations. According to the terms of this law, all pipettes used in bacteriological tests must be submitted to the director of the station for examination wherever they are to be used in making bacterial counts which are to serve as a basis for payment to dairymen. To date some 30,000 pipettes have been examined by the station officials in charge of this work. These pipettes have been found to vary widely and some are declared to be wholly unsuited for the type of work for which they are intended. Errors of 50 per cent or more have been discovered in some of those examined, and at present about 1 out of every 9 pipettes tested is being rejected. It is believed by the station authorities, however, that manufacturers are turning out more accurate glassware.

Virginia Station.—Dr. Ellen A. Reynolds has been appointed to a research position in home economics, effective July 1, and Dr. W. E. Garnett, rural sociologist beginning August 1.

EXPERIMENT STATION RECORD

VOL. 53 SEPTEMBER, 1925 No. 4

Difficulty is frequently experienced by those who are unfamiliar with the experiment station system in this country in visualizing the work of these institutions as a whole. Because of the complete independence, from an administrative standpoint, of the station in one State from that in another, there is a natural tendency to think of them as isolated institutions rather than as component parts of a comprehensive national enterprise. From the point of view of the promotion of research, however, it is their collective rather than their individual status that is ordinarily of greatest interest. For this reason a special service is rendered in assembling, summarizing, and interpreting the data available which pertain to the stations as a group.

The function of a centralizing agency has been discharged for many years by the Office of Experiment Stations, and through its annual reports and other information which it collects a clearer conception of the history and development of the stations may be more conveniently obtained than from any other single source. The latest report of the Office on the work and expenditures of the stations has just been issued. It covers the fiscal year 1923 and marks the completion of 35 years of operations under the Hatch Act.

The report reveals the stations at the close of this period as numbering 69, with a total income from all sources of $9,493,653.20, a staff fully or in part engaged in the work of administration and inquiry consisting of 2,259 persons, and issuing during the year 920 publications aggregating 24,687 pages and distributed to 875,056 addresses on regular mailing lists alone, besides an ever increasing volume of contributions to scientific journals and the dissemination of much information in other ways.

These figures serve to indicate the growth of the station system from relatively meager beginnings in a few States prior to the granting of Federal aid. In the last decade, in fact, the station resources have been more than doubled, and the amount of support from the States, including for 1923 in direct appropriations or apportionments $5,539,077.02, has been fully trebled. During this period the Federal appropriations remained constant at $1,440,000, so that at its close they constituted only about 15 per cent of the total revenue.

The report points out that the stabilizing influence of the Federal appropriations has been out of proportion to their size. For some of the smaller stations they have comprised substantially the entire source of income while in others they have formed a comparatively negligible percentage, but in all cases benefit has accrued not alone from the money supplied but from the stimulation which has come with it. In a large proportion of the States the Federal appropriations were responsible for the original establishment of the stations, and the limitations surrounding the use of the funds have logically led to aid from the States. The supervision exercised, although designed to conserve the Federal funds, has aided in the development of policies which have been applied to all funds. This has had a far-reaching effect, especially in the earlier days.

A special advantage of the Federal appropriations has been their permanence. As the report states, they have not been subject to the fluctuations of appropriations in some of the States, and the measure of supervision and the character of the requirements have been uniform. "In the list of State-supported institutions, stations and substations have come and gone. Their work has grown to a certain point and then frequently suffered relapse. But the stations established under the Hatch Act have all been continued from the time of their organization and have represented a grade and a stability rarely to be found in purely local institutions." This influence, while not always sufficient to prevent interference, has been a notable asset of the Federal contributions.

Apprehension is sometimes expressed, mainly on theoretical grounds, lest centralized Federal supervision dominate the local authority in the management of federally aided institutions. Of all types of activity, research is doubtless the one whose freedom needs most carefully to be guarded, and it is fortunate that in practice so little danger from this source has developed. Apparently, the purpose of the relationship of the Federal Department of Agriculture to the stations has become so well established as to allay any misgivings of this type. Often, in fact, it has been welcomed as supplying an element of restraint from interference from other sources.

The difficulties arising from various attempts at State administrative control, now becoming an increasingly perplexing problem, are discussed in considerable detail. It is shown that a few of the States have already instituted administrative supervision affecting not only details but extending to essential features of policy. Federal allotments have been budgeted with the other resources for similar purposes, and subjected to the same limitations and rules and the same intimate control. Nothing in the line of Federal

control has approached this supervision in degree or character, and the extension of it has come to be looked upon as a menace to the institutions.

The application of the restrictions sometimes imposed upon the stations with reference to their appointments, travel, publications, and similar details of their work is illustrated by numerous examples. Thus, in regard to publications, it is shown that manuscripts from one station have been rejected because they were regarded as too technical or were not thought to be in the interest of agriculture, or they have been edited until they have failed to meet their purpose. Regarding this practice, it is stated that such supervision will be recognized as one of the most serious forms which State supervision could take, " unless it is exercised with the greatest liberality and large reliance is placed upon the judgment of the administrative officers at the institution."

Exception is also specifically taken to the regulation by State officers of expenditures from the Federal funds paid in advance by the Government in order that the stations may have a working capital to meet necessities as they arise. Although it is declared that " the States undoubtedly have a responsibility as regards the use of the Federal funds and are fully justified in a form of audit which will guard these responsibilities, there would appear to be no warrant for setting up procedure which will interfere with the proper use of these funds under the Federal laws or place the station at a disadvantage in carrying out its plans for research after they have been approved by the constituted station authorities and by this Department."

The extent and character of the station work is indicated by the report, but a more current insight is afforded by the classified list of projects carried on by the stations. This list, also prepared by the Office, shows for the year 1924–25 a total of 5,538 projects, of which 5,484 are devoted to research or experimentation. Of this number, 482 are being carried out under the Adams Act.

As classified, the principal group represented is field crops, for which 1,817 projects, or nearly one-third the total number, are enumerated. Other large groups are horticulture with 952 projects, animal husbandry 735, plant pathology 482, economic entomology 472, and soils 343. Smaller groups include dairying 297, agricultural economics 235, fertilizers 213, veterinary medicine 203, agricultural engineering 189, botany 144, genetics 126, forestry 100, chemistry 55, food and nutrition 54, seeds and weeds 53, economic zoology 30, bacteriology 20, meteorology 15, and agrotechny 5 projects.

As compared with the previous year, the principal increase was in field crops, for which a net increase of 95 projects is indicated.

There were also net increases of 50 projects in entomology, 49 in engineering, 43 in soils, 33 in horticulture, 32 each in plant pathology and poultry, 29 in feeding stuffs, 26 in agricultural economics, and 25 in forestry. Obviously, too great significance should not be attached to a comparison of this sort, as the number of projects is necessarily affected by realignments of work, restatements, and similar conditions. None the less the continued prominence given to research in field crops, entomology, and soils which the data indicate is worthy of note, as is also the apparently increased emphasis which is already developing in agricultural engineering, agricultural economics, and forestry.

Some recent tendencies in the station work are brought out in the report which are of considerable interest. A sifting over of the problems of many individual stations with a view to determining their relative importance under present conditions and the need of terminating or redirecting the aim of those which appear less promising is noted with approval as a profitable undertaking for a number of the stations. In some cases such a review has brought out a need for cooperative or supplementary work, and in others it has shown how the work may best be rounded out for completion.

As regards the importance of long-time planning, a topic to which considerable space is devoted, the formulation of a studied plan of development is held to be well-nigh indispensable for every growing institution. "No station can do everything it would be desirable to do, but out of the vast range of possibilities it must select certain lines and subjects which are primarily worthy of attention. This will affect the building up of a personnel and special facilities for research, and it will serve to bring out more definitely the financial needs. By such means a station may express to the authorities of the college and to the public its mature judgment of the field it ought to occupy and what this would involve."

A tendency toward the formulation of such programs, expressed consciously or unconsciously and with more or less definiteness, has been noted in individual stations for some time. Quite often, however, the plans have been of relatively short range, and to some extent they have reflected mainly the composition of the personnel, the existing facilities, the available funds, the current popular demand. These considerations are admittedly important, but strong ground is taken for the outlining of definite objectives for a longer period. Concerning this point the following may well be quoted:

"A station should not fail to be responsive to the needs of its community, but it can not afford to pursue a vacillating course or to have its work represent fragmentary effort. Its program naturally would be related to the matters of primary importance to its locality, and it should not be so formal or fixed as to omit provision

for meeting emergency questions. It would not undertake to be a formally crystallized plan, all-comprehensive in its nature and inflexible in its provisions, but would be designed to serve as a general guide in the administration, development, and financing of the institution. It should never be so inflexible as not to admit of improvement by amendment as new workers and new ideas become available to the station, but, on the other hand, it ought not to be interrupted or abandoned because of changes in personnel or as a result of personal preference of workers. Although opportunity should be preserved for the exercise of initiative and reasonably wide range of freedom in research, such a long-time program would encourage the individual by contributing a larger measure of security for his investigation, and would guard against his needs being overlooked in the annual budget and plans. This might give an added feeling of advantage and permanence among workers which would often reduce the frequency of change from one institution to another, especially among the more mature members.

"Evidently such a program should be general rather than detailed, and should be subject to revision from time to time as circumstances require. But it would have a substantial background in a broad study of the situation and represent a conscious effort to weigh and adapt the various lines of effort in accordance with their merits and relative importance. It would tend to direct the policy of the station along well-defined lines, and in many cases it would have reference to the station as a whole rather than to separate departments.

"The idea of the unity of a station is essential to the making of any well-rounded program. An experiment station can not be viewed merely as an assembly of departments, but rather as a union of effort in which various departments are embraced. These departments are interrelated and drawn together by community of interest in broad questions. Their relationships are more easily discovered and the objective of the station more readily attained if there is encouragement to think beyond the immediate boundaries of individual departments, and this would be an inevitable result of the construction of a long-time program. Moreover, owing to the dependence of stations on one another in working out the agricultural problems of a given region, each institution needs to take into account the activity of other stations in that region. This can be most successfully done if each station has a fairly definite program mapped out for its main lines of research."

Another tendency noted in the stations is the increasing emphasis which is being put on the laboratory side of investigations as compared with gross experiments in which only part of the conditions

are known or controlled. "The broadened and deepened outlook which advance in science has given has shown the complex nature of many problems previously thought to be simple, and has made it possible to view and approach them from different angles. The quick answer which the field experiment or the feeding trial was formerly expected to give has been shown to be subject to variation and less reliable than was assumed. The trend toward fundamental research based on an exact knowledge of conditions and the study of relationships is one of the notable advances in the work of the stations. This trend has been particularly conspicuous in the past few years, even while the stations were laboring under financial stress, and already such research has yielded results whose practical value needs no defense."

One phase of this movement has to do with experimentation in outlying localities. The former tendency of establishing substations of more or less permanence is being superseded by the provision of more temporary facilities, with the local studies, whether done by field workers or experts, being reenforced by investigators in the laboratories of the main station. This is a notable advance, for it husbands the stations' resources while providing for investigation of problems where they exist in typical form, and makes it possible to serve the State more thoroughly and systematically.

The fact that no station exists to itself or may rely exclusively on its own efforts in the solution of its problems is becoming more and more thoroughly recognized. "There is much more marked attempt to take account of what others are doing and have done, to build on what research has already suggested or taught, and to maintain contacts which will give familiarity with these things. It is only a step from this to arranging for coordination in studying complicated problems, and even to entering into more or less definite cooperation. . . . Cooperation between the Federal Department and the experiment stations has steadily increased and is now of large proportion, involving many thousand dollars and a long list of diverse projects."

Improvement is seen in the speed with which completed results are made available to the public. This tendency has been greatly fostered by the remarkable development of scientific journals within recent years, and an increasing share of the station research is finding publication through these channels, although these in turn are becoming more or less seriously congested. The use of the journals has had many advantages for the stations, bringing their findings more directly to the notice of coworkers in other institutions. Moreover, the increased volume of published work makes for the growth of knowledge and its use over a broader field, and helps toward the fuller solution of questions of practical importance.

A steady change in the type of workers is noted. "The demand is now almost universal for thoroughly trained men with graduate study which has broadened their view of the field of science and instilled in them the spirit and methods of science." This demand is being met in increasing measure as graduate instruction is developing in resources and in scope. Leaves of absence for advanced study are becoming more and more common, and the younger men coming into the work have been led to see that participation in graduate study is essential to their advancement.

Closer relations between the graduate school and the station have also been developing, often taking the form of part-time station work with opportunity for graduate study. The report points out that the end sought in such arrangements is in every way desirable, but sounds a note of warning against the danger of undue dependence upon graduate students, particularly in the primary functions of the station. Although it may often employ such students to the mutual advantage of itself and the students themselves, such employment, it is maintained, may, if not carefully regulated, "rob a station of the independence and self-reliance to be looked for in a research institution having its own aims, resources, and responsibilities."

The relation of the station to other branches of the college with which it is connected is another topic which receives frank scrutiny. The fear is expressed that the station may decline in aggressiveness and unity of purpose unless provision is made for the preservation of its individuality by the provision at its head of an officer of experience in charge of research with time to study the work of the station, to counsel with and promote the efforts of its workers, and to maintain the necessary contacts within the college and outside of it. The station, it is stated, "is more than an aggregation of independent departments held together by a name. There is a legitimate and useful place for administration in connection with organized research, and the effective use of public funds calls for a type of study of the field which is not supplied by the individual specialists. A trend away from this, with a minimizing of organization and administration, is not in the direction of preparation for larger support and responsibilities."

That this discussion is not merely academic can be easily demonstrated by an examination of the plan of organization prevailing in the stations today. Of the 48 State stations receiving the Federal funds, only 21 now maintain directors whose administrative duties are confined to the stations. The remaining 27 are in addition deans of the college of agriculture or directors of extension. Many of these cases involve some of the largest institutions of the group, though in

several the situation is materially alleviated by the provision of vice directors or similar officials primarily to represent the station. In general, however, the situation in this respect is probably less encouraging than even a decade ago.

The report as a whole is not only informative but broadly constructive in its discussion of policies and trends. Its purpose is not only to acquaint the reader with the concrete achievements of the year under review but to point out the difficulties and shortcomings with a view to remedial action. In this the Office is exercising the prerogative and duty of leadership implied in the Hatch Act, wherein the Department is instructed to indicate from time to time such lines of inquiry as seem most important, "and in general to furnish such advice and assistance as will best promote the purpose of this act." From this point of view the report takes its appropriate place as another constructive contribution to the development of the experiment station system.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Introduction to organic research, E. E. REID (*New York: D. Van Nostrand Co., 1924, pp. VIII+343*).—This volume, while written from the standpoint of the organic chemist, contains much of value to the research worker in any line of science. This is particularly true of the first few chapters on what might be called the mechanics of research. The first or introductory chapter deals with the research spirit, research ethics, and the qualities essential for research. This is followed by three chapters of a general nature, dealing, respectively, with the classes of research workers and the opportunities and limitations in each class, the incentives to research, and the selection of problems. The next five chapters are concerned with the intelligent use of literature as an aid to research. The first of these gives a survey of the principal chemical journals and publications of chemical societies; the second is concerned with abstract and review journals, bibliographies, and compendiums; the third with libraries, their methods of arrangement and use, methods of supplementing library facilities, and systems of library classification; the fourth with various methods of searching literature and indexing and recording the information secured; and the fifth with patent searches, this section being contributed by W. W. Ammen.

The application of research methods to various problems in organic chemistry is considered in the next eight chapters dealing, respectively, with the study of known compounds, the preparation of known substances, the preparation of new compounds, synthesis of medicinals (by A. D. Hirschfelder), study of structure, study of reactions (by F. O. Rice), organic analysis, and plant processes from laboratory experiments (by C. M. Stine).

The final chapter contains practical suggestions for the preparation of journal articles and technical reports. In addition to the various sections contributed by others, as noted above, many quotations from correspondents are included, together with extensive literature references.

Colloid chemistry of the protoplasm, W. LEPESCHKIN (*Kolloidchemie des Protoplasmas. Berlin: Julius Springer, 1924, pp. XI+228, figs. 22*).—The introductory section of this monograph, which is one of a series entitled Monographien aus dem Gesamtgebiet der Physiologie der Pflanzen und der Tiere, deals with the general principles of colloid chemistry. This is followed by a section on the general colloid chemistry of protoplasm, illustrated by a number of microphotographs showing protoplasmic material in its normal state and after various treatments. A final section on the special colloid chemistry of the protoplasm deals with the chemical composition of the dispersion medium of protoplasm and alterations in the colloidal system of protoplasm brought about by physical agents and by the action of electrolytes and nonelectrolytes. Numerous references to the original literature are given as footnotes.

Chemical constitution and pharmacological action, A. OSWALD (*Chemische Konstitution und Pharmakologische Wirkung. Berlin: Borntraeger Bros., 1924, pp. X+893*).—In this extensive treatise on the pharmacology of carbon

compounds of known constitution, the general principles involved are first discussed, after which the special compounds are discussed under the groupings aliphatic and carboxylic compounds, compounds containing nitrogen, phosphorus, antimony, the halogens, sulfur, selenium, and tellurium, and organometallic compounds. The volume also contains an appendix in which the changes in the carbon compounds in the organism are discussed, and a supplement bringing various sections up to date by the incorporation of material for the most part appearing in the literature after the writing of the text. Throughout the volume many references to the original literature are given as footnotes.

The occurrence of copper, manganese, zinc, nickel, and cobalt in soils, plants, and animals, and their possible function as vital factors, J. S. McHargue (*Jour. Agr. Research [U. S.], 30 (1925), No. 2, pp. 193–196*).—Supplementing an earlier report on the quantitative occurrence of manganese and iron in seeds (E. S. R., 49, p. 202), data are presented on the copper, iron, manganese, and zinc content of the following substances: Blue grass, soy bean leaves and seeds, wheat bran and germs, patent flour, corn germs and endosperm, rice polishings, polished rice, ox lean meat and liver, calf liver and blood, horse testicles, egg yolks, and cod liver chum.

In the vegetable substances listed the copper values ranged from a trace in patent flour, corn endosperm, and polished rice to 46 parts per million in the moisture-free material of wheat germs, iron from 3 parts per million in polished rice to 336 in blue grass and soy bean leaves, manganese from 10 in patent flour and polished rice to 160 in soy bean leaves, and zinc from trace in patent flour, corn endosperm, and polished rice to 160 in wheat germs. Traces of nickel and cobalt are reported to be present in blue grass and soy bean leaves and as much as 3.92 parts per million of nickel in soy bean seed. The ranges reported in the animal tissues were copper from 0.4 part per million in lean meat of the ox to 345 in calf liver, iron from 100 in egg yolk to 1,720 in calf blood, manganese from trace in ox meat and calf blood to 15 in ox liver, and zinc from 15 in ox lean meat to 122.5 in calf liver.

These results and data summarized from the literature are thought to point to the possibility that these elements are of importance in the metabolic processes of plants and animals. A list of 16 references to the literature is appended.

Contribution to the chemistry of decomposition of proteins and amino acids by various groups of migroorganisms, S. A. Waksman and S. Lomanitz (*Jour. Agr. Research [U. S.], 30 (1925), No. 3, pp. 263–281, fig. 1*).—In this extensive investigation of the chemical changes taking place in the decomposition of pure glycine, alanine, phenylalanine, glutamic acid, asparagine, and casein by two fungi, *Trichoderma koningi* and *Zygorhynchus mölleri*, two bacteria, *Bacillus cereus* and *Bacterium fluorescens*, and one yeast, *Actinomyces viridochromogenus*, special attention has been paid to the transformation with relation to the nitrogen of the carbon part of the molecule and to the available carbon in the media as well. The literature on methods for measuring the rapidity and amount of decomposition of proteins is reviewed, the methods used in the present study are outlined, and the data obtained are reported and discussed under each of the amino acids used.

"The results indicate that not all organisms attack proteins and amino acids alike. The two fungi, *T. koningi* and *Z. mölleri*, utilized the various amino acids and the protein both as sources of carbon and nitrogen, the amount of growth and ammonia accumulation depending, however, in the absence of available carbohydrates, upon the available carbon in the amino

acid molecule. A definite relation was found to exist between the carbon (available) content of the amino acid molecule and the amount of ammonia accumulating. The two bacteria tested, *B. cereus* and *B. fluorescens*, behaved differently; the first was unable to attack glycocoll, alanine, and phenylalanine, while glutamic acid and asparagine were acted upon to a limited extent, and casein and other native proteins were decomposed very rapidly. The *B. fluorescens* was unable to decompose casein, but acted upon the various amino acids used very readily. By combining the two organisms in casein media the protein was decomposed very rapidly to ammonia, the *B. cereus* hydrolyzing the casein chiefly to protein derivatives and the *B. fluorescens* decomposing the latter to ammonia.

"Ammonia accumulation can not be used as an index of the proteolytic activities of microorganisms, when the carbon content of the medium is not considered; an organism may decompose a much larger amount of protein in the presence of an available carbohydrate, but produce a much smaller amount of ammonia.

"The Actinomyces was found to be capable of utilizing amino acids and proteins as sources of energy, thus allowing an accumulation of ammonia, even in the presence of dextrose.

"Ammonia formation by microorganisms from amino acids depends upon the carbon-nitrogen ratio of the compound, as well as upon the nature of the organism, as influenced by its utilization of energy."

A list of 33 references to the literature is appended.

Wheat and flour studies.—I, Proteolytic enzymes of flour. I, Autodigestion of flour milled from frozen and nonfrozen wheat harvested at various stages of maturity, P. F. SHARP and R. ELMER (*Cereal Chem., 1 (1924), No. 2, pp. 83–106, figs. 5*).—In this investigation of the possible effect of the proteolytic enzymes of flour on the proteins present in the flour, samples of flour milled from wheat of different stages of maturity were subjected to autolysis at a temperature of 35° C., and determinations made at stated intervals of the protein fractions on the basis of their solubility. The investigation was also extended to flours milled from slightly frosted wheat of various stages of maturity. The protein determinations selected were the protein soluble in 5 per cent potassium sulfate solution, the alcohol-soluble protein in the residue after extraction with potassium sulfate solution, glutenin, amino nitrogen, and gliadin.

Analyses of the various samples of flour before autolysis indicated no change in the glutenin, an increase in the gliadin, and a decrease in the amino nitrogen and the fraction soluble in 5 per cent potassium sulfate solution with the development of the kernel. Slight freezing had no effect on the protein fractions. The autolysis of the flour for a considerable period of time appeared to cause no change in the glutenin, a decrease in the gliadin, and an increase in the potassium sulfate-soluble and amino nitrogen fractions. The decrease in the gliadin did not depend upon the maturity of the kernel, but the increase in the potassium sulfate-soluble fraction was greater in the more immature samples. Freezing appeared to have no appreciable effect upon the proteolytic activity of the flours.

A list of 17 references to the literature is appended.

Wheat and flour studies.—II, Aging. I, The change in hydrogen-ion concentration of wheat and mill products with age, P. F. SHARP (*Cereal Chem., 1 (1924), No. 3, pp. 117–132*).—In continuation of the above investigation, two wheats of the Marquis variety were used. One was a normal sample and the other an immature sample which had been frosted in the dough

stage. The wheats were milled and divided into four mill products—a long patent flour, a low-grade flour, shorts, and bran. These products, together with samples of the original wheat and of the ground wheat, were aged at three different temperatures (outside temperature, room temperature averaging about 22° C., and a temperature of 35°). The samples were of three different moisture contents (the natural content of about 9 per cent, from 4 to 6, and about 15 per cent). The samples were stored in cork-stoppered paraffined bottles and used for H-ion concentration determinations by the electrometric method at 4-week intervals during the early part and at longer intervals toward the end of the experiment, which lasted over a year.

Variations in the initial H-ion concentration of the sample were as follows: Whole wheat, normal pH 6.4 and frosted immature pH 6.55; long patent flour, 6.14 and 6.49; low-grade flour, 6.33 and 6.49; shorts, 6.48 and 6.47; and bran, 6.62 and 6.47, respectively.

While the changes in H-ion concentration of the whole wheat kernel on aging were at first erratic, the later results (using more finely ground samples extracted for a longer period) indicated but little increase in acidity in the normal kernels stored at the lowest temperatures and a slight increase in the frosted samples. Increased temperature and increased moisture content accelerated the rate of increase in H-ion concentration on aging. All of the mill products showed greater increase in H-ion concentration than the original kernels. Normal wheat flour of the lowest moisture content increased in H-ion concentration, 0.08, 0.10, and 0.13 pH units for the three temperatures. With increasing moisture content there was also an increase in the H-ion concentration. At the lowest moisture content the differences in the rate of change of H-ion concentration between the high and low grade flours were not marked, but with increasing moisture the H-ion concentration of the low-grade flours increased more rapidly. The reverse appeared to be true for the immature wheat. Although all of the mill products increased in H-ion concentration at a more rapid rate than those of normal wheat, the low-grade products increased less rapidly than the high. Whether this was due to immaturity or to the frosting has not been determined.

Does the pH of milk change when the milk has been heated to different temperatures? [trans. title], N. L. Cosmovici (*Compt. Rend. Soc. Biol. [Paris], 92 (1925), No. 2, pp. 73, 74*).—Centrifuged milk was heated in cotton-stoppered flasks on the water bath at temperatures of 56, 68, 75, and 100° C. for 30 minutes and then allowed to cool to room temperature. Electrometric determinations of the H-ion concentration of the various samples showed a progressive decrease in pH values with increase in the temperature of heating.

Progress and new theories concerning glue and gelatin [trans. title], O. Gerngross (*Ztschr. Angew. Chem., 38 (1925), No. 5, pp. 85–93*).—This is a brief survey of recent investigations on the chemistry of gelatin, with 111 references to the original literature.

Studies on the swelling of cotton cellulose, [I, II], G. E. Collins and A. M. Williams (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 2 (1923), No. 16, pp. 217–225, figs. 7; 3 (1924), No. 6, pp. 59–66, figs. 6*).—The swelling of cotton fibers was studied at Shirley Institute.

I. *Cotton hairs in solutions of sodium hydroxide* (pp. 217–225).—Observations were made on the change in length, mean diameter, and convolution number of single cotton fibers on immersion in water and solutions of sodium hydroxide.

The increase in length observed on immersion in water and dilute solutions appears due almost entirely to removal of convolutions. In a yarn, the contraction

of the individual hairs when completely mercerized will be the greater the more complete is the removal of the convolutions by the preliminary processes such as water or soda boiling. Maximum swelling seems to occur in a 15 per cent solution of sodium hydroxide. Fibers which have been immersed in the complete range of solutions up to 48 per cent sodium hydroxide on immersion in more dilute solutions also exhibit a maximum swelling in 15 per cent sodium hydroxide. Both the present research and previous work indicate that in processes requiring the maximum swelling of the material no advantage is gained by increasing the concentration of the alkali solution above 15 per cent, i. e., 34° Twad. The behavior of the mercerized cellulose is suggested to be that of an amphoteric electrolyte with pronounced acidic characteristics.

II. *Cotton hairs in solutions of potassium hydroxide* (pp. 59–66).—The swelling of single cotton fibers in solutions of potassium hydroxide was examined and compared with the swelling in solutions of sodium hydroxide. The contraction in length appears to be of the same order of magnitude in both cases. The increase in diameter in the potassium hydroxide solutions was less than half that attained in the sodium hydroxide solutions. Changes in length alone can not therefore be used as a measure of the swelling of cotton in different solutions. A cotton cloth mercerized with potassium hydroxide solution should feel somewhat less full than when mercerized with sodium hydroxide solution and may dye less deeply. The results seem to suggest that the metallic ion has a specific action on the swelling of cellulose in accord with the sequence of ions generally influencing the swelling of colloids.

New observations and experiences on the rapid determination of phosphoric acid by the method of H. Copaux [trans. title], J. Daric (*Bul. Soc. Chim. France, 4. ser., 35 (1924), No. 3, pp. 409–414*).—The author discusses the advantages and disadvantages of the Copaux method of determining phosphoric acid (E. S. R., 46, p. 415). In his opinion the method does not take the place of the gravimetric magnesium pyrophosphate method when the greatest possible accuracy is demanded, but is invaluable when the rapidity of the determination is an important factor, as in routine analyses of phosphates. By a slight modification suggested by Goudet, the method can be used even in solutions containing citric acid.

An arrangement of apparatus for the semimicrodetermination of carbon [trans. title], M. Polonovski (*Bul. Soc. Chim. France, 4. ser., 35 (1924), No. 3, pp. 414–419, fig. 1*).—A train of combustion apparatus for small scale operations is described and illustrated, and data are reported on its use in the analysis of urea and hippuric acid. The amounts of urea taken were 0.0694 and 0.0281 gm., and the yields of carbon 20.02 and 20.09 per cent as compared with the theoretical 20 per cent. The sensitivity of the method is considered to be a function of the precision of the initial weight of the substance.

The quantitative determination of xanthophyll by means of the spectrophotometer and the colorimeter, F. M. Schertz (*Jour. Agr. Research [U. S.], 30 (1925), No. 3, pp. 253–261, figs. 5*).—A study similar to the one previously reported for carotin (E. S. R., 50, p. 713) has been made of the spectrophotometric and colorimetric methods of determining xanthophyll. The xanthophyll was prepared by the method of Willstätter and Stoll (E. S. R., 30, p. 311).

As was true of carotin, the colorimetric method proved less satisfactory than the spectrophotometric, the former being accurate to 61 parts in 358 and the latter to 10 parts in 354. Using the mercury line 435.8 $m\mu$, the specific transmissive index for xanthophyll in ether solution was 2.089 and that of carotin 1.986. It was found possible to distinguish between solutions of xanthophyll and carotin by the relative position of the edge of the absorption band.

Contribution to the physicochemical analysis of vegetable ash by conductivity.—I, Determination of phosphoric acid [trans. title], L. and J. Deshusses (*Helvetica Chim. Acta, 7 (1924), No. 4, pp. 681–688, figs. 4*).—The authors have applied the conductivity method to the determination of phosphoric acid in plant materials such as hay, grass, etc. A neutral solution of the carefully ashed material in the presence of ammonium acetate and alcohol is precipitated by the addition of uranium nitrate in portions of from 0.05 to 0.1 cc. The method is said to yield results agreeing satisfactorily with the gravimetric phosphomolybdate method and to have the advantage of being considerably more rapid.

Glycerol as an aid in ashing flour, R. Hertwig and L. H. Bailey (*Cereal Chem., 1 (1924), No. 2, p. 82*).—The following method of ashing flour is recommended as being much more rapid than the Official method and of equal accuracy:

"Mix 5 gm. of flour in the ashing dish with 10 cc. of a glycerol-alcohol solution made from equal volumes of each. Clean the mixing rod with a small piece of ashless filter paper. Ignite the paper with the sample. After the alcohol has burned off, place in an electric furnace held at approximately 575° C. (dull red) and burn to a white ash. Place in an efficient desiccator. Weigh when cool. Use redistilled glycerol yielding no residue after burning, otherwise make a correction for the blank obtained from 10 cc. of the glycerol-alcohol solution."

Viscosity as a measure of gluten quality, R. A. Gortner (*Cereal Chem., 1 (1924), No. 2, pp. 75–81, fig. 1*).—This paper, which is based largely upon investigations conducted by the author and his associates at the Minnesota Experiment Station on the physicochemical properties of strong and weak flours (E. S. R., 51, p. 803), consists of a brief discussion of the principles underlying determinations of the viscosity of flour suspensions and their interpretation with respect to gluten quality. In particular, the methods adopted for measuring viscosity and interpreting the viscosity readings are reviewed in detail. It is pointed out that determinations of absolute viscosities of flour-water suspensions may yield results which may be interpreted incorrectly on account of the fact that viscosity is the resultant of quantity and quality factors. By determining the constant b in the logarithmic equation

$$\log.\ \text{viscosity} = a + b\ (\log.\ \text{concentration})$$

the quality factor may be distinguished from the quantity factor. A specimen determination is given to illustrate the method.

Federal spring wheat grades: A discussion of their shortcomings and suggested remedies, J. H MacMillan, jr. (*Cereal Chem., 1 (1924), No. 2, pp. 65–74*).—Various defects in the present system of grading wheats are summarized, and a new system which is thought to remedy these defects is outlined and discussed. The properties included in the proposed system as affecting milling and baking value are listed in the order of importance as foreign material, test weight, protein content, moisture content, damage from heating, damage other than heat, and admixtures of other varieties of wheats.

Device for rapid determination of the specific gravity of condensed milk, F. R. Evans (*Jour. Dairy Sci., 8 (1925), No. 1, pp. 37, 38, fig. 1*).—The device described is adapted for use with the cone-shaped cup designed by A. O. Dahlberg for weighing samples of condensed milk to determine the degree of concentration. It consists essentially in a circular disk provided with a hole in the center just large enough to fit over the top of the cup and a collar fitting closely around the neck of the cup and holding the surface of the disk even with the mouth of the cup.

In use the cup is filled with the milk until the sample overflows on the disk. The overflow is removed with a spatula and the top removed from the cup. At the most only a few drops of milk are left on the outside of the cup and these may be removed in much less time than is required to wipe the cup when filled in the usual manner.

A comparative study of methods for determining the per cent of butterfat in dairy products.—I, Ice cream, R. C. Fisher and C. C. Walts (*Jour. Dairy Sci., 8 (1925), No. 1, pp. 54–60*).—In this study, conducted at the Connecticut Storrs Experiment Station, a comparison was made of the Mojonnier method, the Gerber method as modified by Troy and known as the Troy-Fucoma method, and a modified Babcock method for determining fat in ice cream. The modified Babcock test, selected as most satisfactory, is described as follows:

"Weigh 9 gm. of well-mixed sample of ice cream into an 8 per cent milk test bottle. Add 10 cc. of 95 per cent ethyl alcohol, shake well, and add 9 cc. of commercial sulfuric acid (sp. gr. 1.82 to 1.83). Complete test as for milk. Multiply the results by two." The samples of cream tested included 38 of plain vanilla, 2 of strawberry, and 6 of chocolate ice cream. As the chocolate ice cream offered some difficulties, the results obtained with it are reported separately.

Using the Mojonnier test as standard, the average variation for the 40 samples was 0.39 per cent for the Troy-Fucoma and 0.34 per cent for the modified Babcock test. In 22 out of the 40 the Troy-Fucoma gave somewhat higher results and in 31 the modified Babcock slightly lower results than the Mojonnier. The results with the chocolate ice cream, while checking closely in duplicate samples for each method, showed wide variations and lower values than those obtained with the Mojonnier test. A further study of these methods in different laboratories is considered desirable.

A rapid method for the determination of the iodine number of fatty oils with iodine and alcohol [trans. title], B. M. Margosches, W. Hinner, and L. Friedmann (*Ztschr. Angew. Chem., 37 (1924), No. 23, pp. 334–337*).—In the method described from 0.1 to 0.15 gm. of oil in a 500-cc. flask is dissolved in 10 cc. of absolute alcohol at room temperature or 15 cc. of 96 per cent alcohol at 50° C. To the solution 20 cc. of N/5 iodine solution in 96 per cent alcohol is added, followed after shaking by 200 cc. of distilled water. The mixture is allowed to stand for from 3 to 5 minutes, and the excess iodine is then titrated with N/10 sodium thiosulfate solution. The method is suitable only for fats and fatty acids which are liquid at the temperatures employed.

The applicability to solid fats of the rapid method for the determination of the iodine number of fatty oils [trans. title], B. M. Margosches, W. Hinner, and L. Friedmann (*Ztschr. Angew. Chem., 37 (1924), No. 50, pp. 982, 983*).—A slight modification of the method noted above has been found to give accurate results with solid as well as liquid fats. If the solution of fats in absolute alcohol is cooled to room temperature as in the original method, some of the fats precipitate out, but by cooling to 25° C. and then adding the 20 cc. of N/5 alcoholic iodine solution, followed by 200 cc. of water, an emulsion is obtained on shaking from which the fats do not separate out on cooling.

The removal of gummy, oily, and waxy matters from raw cane sugar, C. M. Keyworth and R. B. Forster (*Internatl. Sugar Jour., 26 (1924), No. 310, pp. 546–550*).—An abridged report of the investigation previously noted (E. S. R., 52, p. 13).

The differential calorimeter for animals of medium size [trans. title], A. K. Noyons (*Jour. Physiol. et Path. Gén., 22 (1924), No. 3, pp. 559–574,*

pls. 3).—In principle the calorimeter described consists of two chambers surrounded by water to absorb the heat emitted in one chamber by the experimental animal and in the other by an artificial source of heat, a resistance coil offering approximately the same surface as the animal. By means of a Wheatstone bridge and sensitive galvanometers, the amount of resistance required to keep the two chambers at the same temperature is recorded and serves as a measure of the heat given off by the animal. The operation and use of the calorimeter are discussed in detail, with diagrams and illustrative data.

METEOROLOGY

Solar radiation and the atmosphere, F. V. Tripp and C. F. Brooks (*Bul. Amer. Met. Soc., 6 (1925), No. 2, pp. 25–30*).—This is a brief summary, with references to the principal contributions, of knowledge regarding sources of energy of the atmosphere, the solar constant and its variations, and insolation and the various factors which affect it.

Lake level in relation to rainfall and sunspots, F. Dixey (*Nature [London], 114 (1924), No. 2870, pp. 659–661, fig. 1; abs. in Sci. Abs., Sect. A—Phys., 28 (1925), No. 326, pp. 107, 108*).—A study of available records going back to 1830 is reported, indicating that the level of Lake Nyasa, like those of Lake Victoria and Lake Albert, varies in agreement with the number of sun spots. It is stated that although there have been considerable variations in level within historic times, there is no evidence of any progressive rise or fall.

Climatic conditions [at the Dickinson, N. Dak., Substation], L. Moomaw (*North Dakota Sta. Bul. 189 (1925), pp. 3–5, 45, 46*).—A summary, with brief notes, is given of precipitation, evaporation, wind velocity, and length of the growing season at Dickinson, N. Dak., during 1922 and 1923, as compared with similar data for previous years. From the standpoint of crop production both seasons were better than the average. The precipitation of 1922 was 18.02 in. and of 1923 19.73 in., as compared with a 32-year average of 15.61 in. The frost-free period was 166 days in 1922 and 120 days in 1923, as compared with the 17-year average of 112 days. The seasonal (April to September) evaporation was 31.99 in. in 1922 and 30.07 in. in 1923, as compared with the 17-year average of 32.69 in.

Climatic conditions [of the Umatilla project], H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 342 (1925), pp. 4, 5*).—Observations on temperature, precipitation, evaporation, frost dates, and wind at Hermiston, Oreg., during 1922 and previous years are summarized.

Weather conditions on the [Belle Fourche Reclamation] Project, B. Aune (*U. S. Dept. Agr., Dept. Circ. 339 (1925), pp. 1–3*).—Data for temperature, precipitation, evaporation, frost dates, and wind velocity at the Belle Fourche Experiment Farm near Newell, S. Dak., for 1919–1922 and previous years back to 1908 are summarized.

Weather observations at Los Banos, 1916–1923, R. P. Estioko (*Philippine Agr., 13 (1925), No. 9, pp. 407, 408, pls. 2*).—Two charts are given and briefly explained, which show (1) the monthly maximum and minimum temperature extremes at the College of Agriculture, Los Banos, and (2) the rainfall at the same place. Brief reference is also made to observations on evaporation, humidity, and wind velocity, and also to observations on temperature and precipitation at several neighboring places.

The mean temperature for the 8-year period at the College of Agriculture was 25.8° C. (78.44° F.). The highest monthly maximum temperature for the period was 33.2° and the lowest 24°. The average temperature is highest in

May and gradually falls until January. The annual rainfall varies from 1,600 to 3,000 mm. (40.6 to 76.2 in.) the average for the 8-year period being 2,150 mm. "The heavy rains begin in June and usually decline in quantity about the month of January, from which time the rainfall is light. There was, however, hardly a month during this 8-year period in which there was no rain." The daily evaporation as measured by the Livingston atmometer ranged from 1 to 60 cc. and the insolation from 0 to 30 cc. The rate of evaporation varied, as a rule, directly with the insolation. "The highest figures were obtained during the months of January, February, March, April, and May, and the lowest during the months of July, August, September, and October of each year. The first group of months constitutes the dry season and the latter group the wet." The average daily humidity varied from 75 to 97 per cent. The velocity of the wind varied from 0.3 to 19.2 miles per hour. "Strong winds usually occur during the months of June, July, and August and generally come from the northeasterly direction."

A third bioclimatic study in the Egyptian desert, C. B. WILLIAMS (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 50 (1924), pp. [2]+32, pls. 7*).—This is the third of a series of observations on temperature and moisture conditions, with particular reference to plant and animal life in the Wady Digla, a desert ravine about 200 ft. deep, 300 yards across at the top, and 80 yards across at the bottom. The early observations, previously noted (E. S. R., 49, p. 208; 52, p. 316), were made in August, 1922, at the hot, dry time of the year and in March, 1923, at the cold, dry time. In the study here reported, the observations were repeated during 7½ days in December, 1923, when the temperature was about the same as in March but the moisture considerably higher.

Summarizing the results, which are reported in detail and recorded in graphs, the author concludes that "the air shade temperature ranges for an average year from below 5° to above 40° C. [41 to 104° F.], perhaps occasionally reaching 0° and occasionally 45°. The mean daily range, however, is not as great as one usually associates with desert conditions. . . . The surface ranges in temperatures from about 60° to about 5° or lower during the year. . . . The daily range is 30 to 35° when the sand is fully exposed to the sun, but is much less when it is partially shaded at any time of the day. The mean temperature of the sand at a depth of 30 cm. (1 ft.) is 33.5° in August, 19.7° in March, and 17.1° in December. These are the greatest extremes that need be encountered by an animal that can burrow to this depth, and are only slightly greater than the daily air range on a summer day.

"In summer the temperatures are higher, the daily change of temperature is greatest, the daily change of humidity is greatest, and the evaporation is nearly three times that in December. In addition there is no rain and only rarely dew. These are the conditions most inimical to plant and animal life in the open."

In winter vegetation increases followed by increase of insect life in spring, which is largely cut off by succeeding hot weather. No particularly striking change of air temperature at sunset was observed.

Appendixes give lists enumerating over 200 species of birds, insects, and plants observed in the vicinity of the observation camp.

The cotton plant in relation to temperature and rainfall, C. L. ROBERTSON (*Rhodesia Agr. Jour., 22 (1925), No. 1, pp. 71–76, figs. 4*).—This quotes Kincer's article (E. S. R., 51, p. 810), reproducing and commenting upon graphs published by Williams (E. S. R., 50, p. 415). The graphs are reproduced with the addition of rainfall and temperature curves for Rhodesia to those for the Sudan, Nigeria, Egypt, Mesopotamia, Turkestan, Madras, and Texas.

In Rhodesia the mean temperature falls throughout the whole period of growth, which is from the middle of November to the middle of May, picking ending the middle of August, and is lower at the beginning of the picking season than in any of the other countries named. Rhodesian rainfall conditions compare favorably with those of Madras and Nigeria and are excellent during the picking season. The temperature and rainfall conditions in Rhodesia indicate in general the desirability of early planting, quick germination, and rapid and uninterrupted growth.

SOILS—FERTILIZERS

Studies on the moisture equivalent of soils, J. C. Russel and W. W. Burr (*Soil Sci., 19 (1925), No. 4, pp. 251-266, figs. 9*).—Studies conducted at the University of Nebraska on the effect of speed, period of centrifuging, and depth of soil layer in the cup on the moisture equivalent for 16 widely different soils are reported, the purpose being to formulate either a less empirical definition of the moisture equivalent or a better appreciation of the necessity of strict adherence to the present adopted procedure.

It was found that the relation of the moisture equivalent to the centrifugal force employed is not linear as previously suggested, but is represented by the equation $M=\frac{K}{G^n}$, in which M is the moisture equivalent at the centrifugal force G in terms of gravity, and n and K are characteristic constants for each soil. The moisture equivalent was found to be decreased about 1 per cent for each soil when the depth of the layer in the moisture equivalent cup is increased from 10 to 12 mm. The moisture equivalent decreased 0.6 per cent for each soil for each 20-minute increase in the period of centrifuging after the first 20 minutes.

The ratio of the moisture equivalent to the hygroscopic coefficient is practically linear only at 1,000 g and upwards. The equation of the relation of moisture equivalent and maximum water capacity to the hygroscopic coefficient is a simple parabola of form, $a+bx+cx^2$=moisture equivalent, where x is the hygroscopic coefficient. For very low values of g, from 1 to 100, a, b, and c are constants of considerable magnitude. As the force of centrifuging is increased, first a and later c reduces to zero, and the equation becomes linear.

The relation of moisture equivalent to hygroscopic coefficient is not a natural constant, but an experimental one only, in which a considerable element of probable variation exists. The probable variation is the same at all centrifugal forces when the relation of hygroscopic coefficient to moisture equivalent is expressed as a quadratic formula, but when expressed as a linear formula the probable variation is a minimum between 1,000 and 1,500 g.

The results are taken to indicate that the moisture equivalent may be best determined by using a centrifugal force of 1,000 g, a depth of soil of 10 mm., and a period of centrifuging of 40 minutes.

The effect of irrigation upon soil temperatures, E. McK. Taylor (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 53 (1924), pp. 1+18, pls. 7*).—Studies of soil temperatures under various crops and on fallow land receiving irrigation are reported.

It was found that the effect of irrigation is determined mainly by the temperature conditions of the soil immediately prior to irrigation. If the surface soil temperatures are higher than those of the lower layers, increases in temperature of the lower layers take place on irrigation, and vice versa. The temperature effects of irrigation are attributed to the displacement of the

water already present in the soil by the addition of irrigation water to the surface.

The effect of rain upon soil temperature is shown to be similar to that produced by irrigation water, but not of the same magnitude, owing to the different rates at which the water is placed upon the surface of the soil. It is also shown that the conductivity of the soil is increased by irrigation. The suggestion of Keen and Russell, that the diffusivity of soil increases to a maximum with increasing moisture content and finally decreases as the moisture content is further increased, was confirmed.

The heat of wetting as a new means of estimating the colloidal material in soils, G. Bouyoucos (*Soil Sci., 19 (1925), No. 2, pp. 153–162*).—In a contribution from the Michigan Experiment Station the property of heat of wetting is presented as a new means of estimating the colloidal material in soils. The method involved consists of determining the heat of wetting of the soil, then extracting a certain amount of colloids from the soil and determining their heat of wetting. With the heat of wetting of both the soil and the extracted colloids known, the colloidal content can be readily calculated. This method is said to be simple, rapid, and accurate, and apparently superior to the vapor-adsorption and dye-adsorption methods. It has also been found that the property of heat of wetting is due almost entirely to the colloidal material.

According to the heat of wetting method the amount of colloidal material present in soil has been found to be much higher than has heretofore been believed. This amount varied from 17.67 per cent in a sandy loam to 70.56 per cent in a clay, with most of the clays and clay loams containing more than 50 per cent. It was further found that reactivity of material may not depend entirely upon the size of its particles but also upon the state of activation, which may be due to several factors such as degree of decomposition or the nature of the surface. The colloidal material of soils appeared to be quite stable and not easily altered.

The utilization of seedlings in the estimation of soil nutrients, H. Neubauer (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 2 (1924), No. 4, pp. 789–797*).—A method of estimating the amount of available nutrient material in soils is briefly described, which makes use of the fact that young seedlings do not live as long as possible upon the reserve materials of the seed, but *employ their rootlets, as soon as they are developed, to obtain nutritive substances* from the soil. If a large number of young seedlings are planted in a small quantity of soil the starving rootlets extract all of the assimilable substances which their strength permits, but leave the nonassimilable matter untouched. In this manner the plant rootlets separate the soluble from the insoluble substances. Tests of this method indicated that the manurial condition of the soil as shown by the behavior of young seedlings was fully confirmed by field manurial experiments.

Availability of nutrients in subsoils, C. E. Millar (*Soil Sci., 19 (1925), No. 4, pp. 275–285, figs. 7*).—Studies conducted at the Michigan Agricultural College are reported, in which corn was found to make very little growth on the portions of the profiles of Coloma loamy sand and Leslie sandy loam below the surface or humus-bearing horizon. The third or often so-called concentration horizon of the Leslie sandy loam supported no greater growth than did the second or leached horizon. The addition of available nitrogen had an inappreciable effect on the amount of growth. These results are taken to indicate that, if the amount of growth is a measure of the availability of the nutrient material in the horizons studied, the corn plant draws very sparingly on the soil horizons below the surface.

Toxic properties of inactive subsoil [trans. title], F. TERLIKOWSKI (*Rocz. Nauk Rolnicz., 9 (1923), No. 2, pp. 336–343*).—Brief studies of the toxic properties of an inactive subsoil toward plants indicated that the toxic effect could be removed by the addition of sodium or calcium carbonate. The time of year also seemed to have some influence. It is considered probable that the cause lies in the presence of acid organic substances, which decompose during warm seasons.

Soil reaction and crop growth [trans. title], O. ARRHENIUS (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 278 (1925), pp. 22, figs. 18*).—Studies on the influence of soil reaction on the development and yield of important agricultural crops are reported.

It was found that the different plants behaved in a very different manner toward soil reaction. Turnips, potatoes, oats, and timothy yielded best with a high soil acidity, corresponding to about pH 5. Rye gave best results at a pH of between 5 and 6, and swedes and red clover at a pH just above 6. Wheat yielded the best crop at about pH 7, and alfalfa, barley, and sugar beets yielded best with a slightly alkaline reaction.

The results of pot experiments were confirmed by those of field experiments.

Alkali studies.—II, Tolerance of alfalfa, corn, and sweet clover for alkali in Idaho soils, R. E. NEIDIG and H. P. MAGNUSON (*Soil Sci., 19 (1925), No. 2, pp. 115–124*).—In a second contribution to the subject from the Idaho Experiment Station (E. S. R., 52, p. 812), five crops of alfalfa were grown in potometers containing artificial alkali soil made by additions of sodium carbonate, sodium chloride, and sodium sulfate, singly and in varying combinations.

The maximum tolerance of alfalfa for sodium carbonate when grown on Boise silt loam soil was found to approximate 0.6 per cent added salt or 0.2 per cent recoverable sodium carbonate. The amount of sodium chloride permitting a normal yield of alfalfa for the fourth and fifth cuttings was 0.2 per cent added salt and 0.16 per cent recoverable salt. This concentration materially reduced the yield of the first three crops. The addition of 0.9 per cent of sodium sulfate, with a recovery of 0.74 per cent, was not great enough to materially affect the yield. All concentrations of added sodium carbonate which yielded recoverable salts up to 0.15 per cent showed marked stimulation of the growth of alfalfa, as did also sodium sulfate additions which showed recoverable salts up to 0.37 per cent.

In the 2- or 3-salt combinations each salt maintained its characteristic influence when in predominance, and showed additive toxicity when the salts were present in similar amounts. Small amounts of chlorides were especially toxic in combination with the other two salts. The effect of alkali salts on the germination of alfalfa was greater than that on the plants when they had established growth. Sodium chloride showed the greatest toxic effect on germination, followed in order by sodium carbonate and sodium sulfate.

Corn grown on soils from which the alfalfa had been harvested and which had been leached by rain was very sensitive to all the alkali salts, especially sodium carbonate. Sweet clover was found to withstand the effect of large amounts of carbonates in the soil and also to overcome unfavorable physical conditions of the soil, whether produced by added carbonates or by the leaching out of other salts.

The ternary systems $CaO-Fe_2O_3-CaSO_4$ and $CaO-Al_2O_3-CaSO_4$ as explaining the retention of sulfates by heavily limed soil, W. H. MACINTIRE and W. M. SHAW (*Soil Sci., 19 (1925), No. 2, pp. 125–151, figs. 12*).—Studies conducted at

the Tennessee Experiment Station of the inhibiting effect of heavy additions of burnt lime on the losses from soils of native sulfates, rainfall sulfates, and sulfates derived from additions of ferrous sulphate, pyrite, and powdered sulfur are reported. Data are also reported on the causes of extensive and immediate absorptions of sulfates in soil-lime, ignited soil-lime, and commercial lime suspensions. The results are presented in considerable chemical detail.

The relation of fungi to the numbers of bacteria in the soil, W. E. FLEMING (*Soil Sci., 19 (1925), No. 4, pp. 301–307*).—Studies conducted at the New Jersey Experiment Stations on the relation between fungi and the numbers of bacteria in soils are reported, in which soils partially sterilized with 2 per cent of carbon disulfide were inoculated with suspensions of untreated soil and with pure cultures of Penicillium, Trichoderma, Aspergillus, Fusarium, and Zygorhynchus.

The results of the determinations indicated that the development of bacteria depends more upon the available organic matter in the soil than upon the presence or absence of fungi. There was no indication that the filamentous fungi had a depressing action on the development of heterotrophic bacteria, especially in the presence of an abundance of organic matter. The relative numbers of bacteria and fungi in the soil appeared to be governed largely by the ability of the organisms to utilize the energy present in the soil.

Influence of nutritive elements on the development of soil bacteria [trans. title], D. CHOUCHACK (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 24, pp. 2001, 2002*).—Continuing work previously noted (E. S. R., 51, p. 723), studies are reported which showed that increasing the additions of nutritive elements such as nitrogen or phosphorus to the soil has an action on the development of soil bacteria similar to that on the development of crops.

The influence of nitrifying bacteria on the nitrogenous matter of stable manure [trans. title], B. NIKLEWSKI (*Rocz. Nauk Rolnicz., 9 (1923), No. 2, pp. 193–210*).—Experiments are reported which showed that in artificial cultures of nitrifying bacteria ammonia is nitrified in the presence of stable manure, and that the products of this process eventually denitrify. Stable manure was found to retain its nitrogen best during a period of 255 days if made free of nitrifying bacteria by the use of sterilized straw and by protection from infection, the total losses being about 3 per cent. Manure inoculated with nitrifying bacteria lost from 20 to 24 per cent of its nitrogen. It was further found that the organic colloidal matter in manure undergoes bacterial nitrification.

Nitrate leachings as influenced by calcic and magnesic additions, with and without sulfur carriers, W. H. MACINTIRE and J. B. YOUNG (*Soil Sci., 19 (1925), No. 4, pp. 309–323, figs. 2*).—Data obtained in studies at the Tennessee Experiment Station on nitrate losses over a 6-year period from 22 embedded tanks of soil receiving different calcic and magnesic treatments, with and without one of three different forms of sulfur, are reported.

Treatments of calcium oxide and 100-mesh limestone at the rate of 2,000 lbs. per acre gave almost identical total results, while increasing the rate of application to 3,750 lbs. increased the nitrate losses for both materials. Unsupplemented additions of ferrous sulfate, pyrite, and elementary sulfur decreased the nitrate losses, but supplements of both calcium and magnesium oxides at the 3,750-lb. rate overcame the depressive effects of the three sulfur materials, magnesium oxide being the more active. Supplements of calcium oxide at the 32-ton rate caused a much greater total loss of nitrates than that induced by equivalent additions of magnesium oxide to each of the three sulfur materials. The 32-ton calcium oxide treatments were initially decidedly inhibitive to nitrate losses, while the corresponding magnesium oxide additions were not.

Laboratory studies of the same soil, moist and after storage and with and without calcium nitrate treatments, showed that the small initial loss of nitrates from heavy liming was due to a deficient nitrate supply rather than to a decrease in the solubility of the nitrate.

Trend of developments in the nitrogen problem, J. M. BRAHAM (*Indus. and Engin. Chem., 16 (1924), No. 12, pp. 1277–1280, figs. 3*).—In a contribution from the U. S. D. A. Fixed Nitrogen Research Laboratory a brief outline of the nitrogen situation is presented.

The absorption of the nitrogen of peat by crops [trans. title], P. KUPREENOK (COOPREENOK) (*Trudy Nauch. Inst. Udobr. (Trans. Inst. Fert. [Moscow]) No. 19 (1923), pp. 19*).—Experiments with three peats are reported which showed that an upland moor peat was the best source of available nitrogen to crops. The use of lime and manure with the peat was necessary in order to obtain the best results. Peat fertilization was found to increase the total nitrogen content of the soil and of crops.

The influence of manganese on the nitrification of ammonia [trans. title], Z. PIETRUSZCZYŃSKI (*Rocz. Nauk Rolnicz., 9 (1923), No. 2, pp. 235–287*).—Soil and solution studies on the influence of manganese on the nitrification of the ammonia of ammonium sulfate and on the activity of sodium nitrate, as indicated by the growth of cereals and potatoes, are reported.

Manganese was found to increase the intensity of nitrification in certain concentrations. An amount of 0.0005 per cent of potassium permanganate was the maximum permitting nitrification in liquid cultures, and amounts greater than 0.001 per cent inhibited nitrification. Different manganese salts did not have the same catalytic effect. Manganese sulfate had the greatest effect, followed in order by manganese chloride and manganese carbonate. About the same results were observed in soil as in liquid cultures.

The pot experiments led to the conclusion that the action of manganese on the nitrification of soil ammonia results in a favorable influence on the oats crop. Manganese was found to increase the absorption of nitrogen by crops.

The agricultural value of some of the newer nitrogenous fertilizers, J. G. LIPMAN and H. C. MCLEAN (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 190–192*).—Studies conducted at the New Jersey Experiment Stations are briefly reported, indicating that among the newer synthetic nitrogenous fertilizers ammonium phosphate, ammonium chloride, and urea give promise of great usefulness, especially when due consideration is given to factors of soil, crop, and climate. It is emphasized that the method of application and distribution should be such as to avoid interference with germination and injury to the young plants, and that in the preparation of fertilizer mixtures incompatible materials should not be employed. The high nitrogen content, low hygroscopicity, nontoxicity, and suitability of pure urea for mixing with a wide range of fertilizer materials make it peculiarly desirable among the synthetic nitrogen products.

Solubilization of phosphates by bacteria [trans. title], E. KAYSER (*Compt. Rend. Acad. Agr. France, 10 (1924), No. 25, pp. 710–712; abs. in Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 1, p. 69*).—Two organisms isolated from bat guano were found to act differently on bone dust and Tunisian phosphate. The more active organism dissolved 44 per cent of the phosphoric acid of the bone dust and 10 per cent of that of the Tunisian phosphate. The other organism seemed to prefer the Tunisian phosphate, dissolving 14 per cent of its phosphoric acid content and only 11 per cent of that of the bone dust.

The recovery of potash salts from Steffen waste water, W. J. GELDARD and W. D. CHASE (*Planter and Sugar Manfr., 74 (1925), No. 11, pp. 208–210,*

g. 1).—In a contribution from the U. S. Bureau of Standards statistics are resented which indicate that the annual production of Steffen waste water in the United States is about 2,500,000 tons, and that practically no attempts are being made to recover the potash and nitrogen it is known to contain.

Laboratory studies are also reported which show that Steffen waste water may be concentrated beyond the point to which it is possible to go in the regular sugar-house evaporator without difficulty, and in so doing to separate from the liquor a considerable quantity of salts which have a decided commercial value. The only change required in the regular equipment to do this is the introduction of a salt evaporator into the series of multiple effect evaporators, thereby allowing the salts which separate during concentration of the waste water to be removed as they are formed.

If the evaporation is controlled so that a final liquor of a definite predetermined specific gravity is obtained, the salts which separate will be only potassium salts, practically free of sodium or other metals. In the experiments the salts obtained were a mixture of the chloride, nitrate, and sulfate of potassium, with the first in preponderance and only a small quantity of the last. This particular mixture is considered to be especially desirable as fertilizer material because of its high nitrate content. A possible yield of 227 lbs. of crude salts or of 199 lbs. of recrystallized salts from each ton of concentrated waste water produced was indicated.

The effect of the different degrees of fineness of limestone upon decomposition of organic matter in the soil, C. R. Runk (*Soil Sci., 19 (1925), No. 4, pp. 267–274, fig. 1*).—Studies conducted at the Delaware Experiment Station are reported which showed that in promoting decomposition of organic matter in the soil 60- and 100-mesh limestone materials are fully as effective as calcium oxide. Calcium oxide and 100-mesh limestone also had the most favorable effects upon the activity of soil organisms. There was no appreciable difference in the effect of the different lime materials upon the availability of soil phosphorus or soil potassium.

AGRICULTURAL BOTANY

On the nature of the centrosomal force, H. G. Cannon (*Jour. Genetics, 13 (1923), No. 1, pp. 47–78, figs. 4*).—The author, referring to a contribution by A. B. Lamb[1] and outlining his own deductions therefrom, with supporting evidence and argument, considers such deductions as in complete agreement with the views of A. Brachet.[2] "The visible activity of the centrosome, that is, its power of forming an energid, will depend on the physical state of the cytoplasm, this physical state being determined by the relative densities of its constituents. The apparent periodicity of the activity of the centrosome will be a result of the cyclic changes in the constitution of the cell cytoplasm."

The effects of electrical stimulation on plant cell structures [trans. title], R. Kôketsu (*Jour. Dept. Agr., Kyushu Imp. Univ., 1 (1923), No. 1, pp. 133, figs. 40*).—The research here first recorded, carried out during 1914 to 1918, dealt comprehensively with phases and effects of electrical influence and action on plant cell structures, behavior, and development. A comprehensive bibliography is furnished.

[1] A New Explanation of the Mechanics of Mitosis. Jour. Expt. Zool., 5 (1908), pp. 27–33.

[2] L'Oeuf et les Facteurs de l'Ontogénèse. Paris: Octave Doin & Son, 1917, pp. 349, figs. 57.

Regeneration of roots and shoots in cuttings of seakale, W. N. Jones (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 486*).—Experiments on the regeneration of roots and shoots in root cuttings of sea kale showed that the end of the cutting nearest the original root apex has a marked capacity for producing roots. Only a slight tendency appears for this capacity to extend any distance from this end, and none of the methods tried has increased this distance.

The end of the cutting nearest the original stem apex shows a marked capacity for shoot production, with a strong tendency for this capacity to spread along the cutting. Various means accentuate this tendency. Short pieces of root, when they regenerate, produce shoots from both ends. Roots that are produced arise from one end only. Repeated attempts made to correlate this regeneration gradient with a gradient of electrical potential or H-ion concentration have been without conclusive results.

Anatomy of the vegetative organs of sugar cane, E. Artschwager (*Jour. Agr. Research [U. S.], 30 (1925), No. 3, pp. 197–242, pls. 25, figs. 8*).—A detailed account is given of a study of the anatomy of the vegetative organs of sugar cane to supply information regarding the structure of this plant.

The structure of some nectar glands of Iowa honey plants, W. S. Cook (*Iowa Acad. Sci. Proc., 30 (1923), pp. 301–329, figs. 34*).—Stalked nectar glands form as such an exception to the rule as regards nectar tissue, which always consists of an epidermal layer with or without stomata and of a subepidermal layer varying in thickness, and which is easily recognized by its (generally) smaller cells, these being always filled with a dense granular protoplasm. In all nectar glands studied, vascular bundles were found in close proximity, running either parallel or at right angles to the nectar tissue. Sometimes they even extend into the nectar tissue.

A study of the conductive tissues in shoots of the Bartlett pear and the relationship of food movement to dominance of the apical buds, F. E. Gardner (*California Sta. Tech. Paper 20 (1925), pp. 42, pls. 8*).—Attention is called to the tendency of most trees to produce branches from the terminal and apical buds while the basal buds of the shoot remain dormant. Bending, wounding, ringing, etc., bring about the growth of buds that would ordinarily remain dormant, and the author has made a study of the conductive tissues of the Bartlett pear from the standpoint of nutrition. It was found that substances which move through the tracheae were not responsible for the initiation of bud growth. The investigation was then centered on a study of the tissues concerned in the conduction of foods, and it was found that in shoots of the Bartlett pear the phloem is the tissue largely affected in the longitudinal movement of foods and that there is a direct relationship of food movement to dominance of apical buds, in that the nutritive condition from the carbohydrate-nitrogen standpoint is presumably involved.

The developmental movements of plants and their teleological significance, K. Goebel (*Die Entfaltungsbewegungen der Pflanzen und deren Teleologische Deutung. Jena: Gustav Fischer, 1924, 2. ed., rev. and enl., pp. X+565, figs. 279*).—A second edition of the work previously noted (E. S. R., 46, p. 224) contains, besides various alterations and additions, an added section on differences of flower configuration in the Papilionaceae and their biological significance.

A study of a milk-coagulating enzyme of Solanum elaeagnifolium, A. Bodansky (*Jour. Biol. Chem., 61 (1924), No. 2, pp. 365–375*).—The widespread occurrence of plant chymases having suggested the presence of a chymase in the berries of *S. elaeagnifolium*, the author undertook to ascertain the presence of a chymase in this plant; to determine its distribution in the plant and its abundance and activity at different seasons and stages of growth; to investi-

gate its properties; to test for other proteolytic enzymes sometimes associated with chymases; to study in greater detail any differences between animal rennin and plant chymases, with reference to the mechanism of coagulation of casein; and to establish any toxicity of the raw material and extract. The first three of these problems are dealt with in the present paper. An early series of experiments has been reported briefly (E. S. R., 36, p. 412). The present report relates to more recent work of broader scope with perfected methods.

The presence of a casein coagulase (chymase) in the berries of *S. elaeagnifolium* is demonstrated, and the method of its separation is given. The general conformity of the chymase to the law of Segelcke and Storch, that coagulation time is inversely proportional to quantity of rennet used, is confirmed, though there is, apparently, a slight increase, with dilution, in relative activity. The enzyme shows a higher optimum temperature than animal rennin, and more resistance to heat. The activity of the enzyme is not appreciably affected by dialysis. It is suggested that the reported differences between plant and animal chymases may be due in part to the inconstant composition of the milk used. A casein substrate is suggested. Chymase was found in appreciable amounts only in the berries. No consistent variation was found in the potency of extracts prepared from berries collected at different times during the growing season, or separated according to their apparent ripeness.

Leaf chlorosis and premature fall [trans. title], J. Capus (*Rev. Vitic.*, *60 (1924), No. 1542, p. 54*).—Yellowing and premature fall of grape leaves is ascribed, in case of the more open soils, primarily to prevalent drought or to deep cultivation during a dry season and consequent excessive loss of the deeper soil water.

Migration of nitrogenous substances during the yellowing of autumn leaves [trans. title], R. Combes (*Bul. Soc. Bot. France*, *71 (1924), No. 1-2, pp. 43-48; noted in Gard. Chron., 3. ser., 76 (1924), No. 1966, p. 141*).—In case of *Fagus silvatica*, *Aesculus hippocastanum*, *Castanea vulgaris*, *Acer pseudoplatanus*, and *Tilia platyphylla*, during the course of the yellowing of the leaves which precedes their fall between one-half and two-thirds of the nitrogenous material passes out, whereas leaves separated before change begins lose little or no nitrogen. Rain or dew carries away little nitrogen (though from 25 to 35 per cent of carbohydrate material may be lost in this way), so that of the nitrogen which is removed from the yellowing leaves practically all passes to the trunk.

Economical use of nitrogen, phosphorus, and potassium by barley, oats, and wheat in solution cultures, F. R. Pember and F. T. McLean (*Rhode Island Sta. Bul. 199 (1925), pp. 5-53, figs. 6*).—This is a continuation of studies of fertilizer nutrient requirements of cereals grown in artificial cultures. The first part of the work has been previously reported (E. S. R., 37, p. 34).

The main purpose of the investigation was to find the minimum content of each fertilizer nutrient required to be present in the plants in order that they would mature good grain yields. Three-weeks-old plants were grown for 12 weeks in solutions with regulated amounts of nitrogen, phosphorus, and potassium, and then allowed to mature in well water or distilled water.

Under the conditions of the experiments the growth and yields were not significantly modified by increasing the total osmotic pressure of the culture solution from 0.25 atmosphere to 1.5 atmospheres. The employment of relatively large amounts of nitrogen, phosphorus, and potassium resulted in plants of abnormal appearance and only moderate yield. Deficiency of nitrogen pro-

duced plants of small size with yellowish foliage. The minimum nitrogen requirement for high yield over a period of 4 years was for oats approximately 0.7 per cent, and for wheat and barley 1 per cent of the total dry matter. The plants were found to be unable to utilize effectively a suboptimum amount of nitrogen, if it was all supplied before the expiration of the seventh week from the seed.

Deficiency of phosphorus caused the plants to develop a purple tinge, particularly in the stalks. The minimum percentage for high yield of these grains over a period of 5 years was 0.1 per cent of phosphoric acid in the total dry weight for oats and 0.2 per cent for wheat and barley. In the experiments reported upon it was found that the grains could utilize a suboptimum amount of phosphorus equally well, whether supplied early, in the middle period, or late in the life of the plants. The grain yield was decreased if a deficient amount of phosphorus was added early and withheld during the last eight weeks of growth, rather than being supplied uniformly or mainly later in the growth period.

A deficiency of potassium resulted in dark brown spots on the leaves of barley, but this symptom was not observed on the leaves of the other grains. The minimum potassium requirements for good yields were for oats, 0.5 per cent; wheat, 0.6: and barley, 0.7 per cent of K_2O in the total dry matter. Wheat was found to make more effective use of a limited amount of potassium if supplied during a 4-week period (from the third to the seventh week from the seed) than if the same amount was supplied over a period of 12 weeks.

Both the nitrogen and potassium contents of the culture plants were quite similar to corresponding values for field-grown plants. The solution culture plants contained about one-third as much phosphorus as did soil culture plants and field plants grown at the station, and this is believed to be due to some characteristic of the Rhode Island soil.

The action of hexamethylenetetramine on higher plants [trans. title], E. and G. NICOLAS (*Compt. Rend. Acad. Sci.* [*Paris*], *175* (*1922*), *No. 19*, *pp. 836–838*).—A partial investigation of the effects of hexamethylenetetramine on higher plants shows augmentation of weight and considerable increase of development as regards both number and size of leaves. Penicillium and Polytrichum utilize this substance as a source of nitrogen better than they utilize ammonium nitrate. Lower plant forms tolerate larger doses of hexamethylenetetramine than do the higher plants.

The influence of formol on higher plants [trans. title], E. and G. NICOLAS (*Compt. Rend. Acad. Sci.* [*Paris*], *175* (*1922*), *No. 26*, *pp. 1437–1439*).—On the basis of data here presented as resulting from a continuation of the work noted above, it is claimed that formaldehyde in aqueous solution at the proportion of 821 mg. per liter constitutes an alimentary supply source for bean plants, since these plants at that strength gained weight over the controls, the gain continuing throughout the experiment. When there is a partial or complete lack of chlorophyll, formaldehyde exerts a toxic influence. As soon as the chlorophyll supply is sufficient to its rôle as catalyzer, the action of the formol becomes favorable.

Aluminum salts and acids at varying hydrogen-ion concentrations, in relation to plant growth in water cultures, S. D. CONNER and O. H. SEARS (*Soil Sci.*, *13* (*1922*), *No. 1*, *pp. 23–34*, *pls. 4*, *fig. 1*).—Barley, rye, and pop corn in Tottingham's sub-optimum nutrient solution showed approximately the same degree of toxicity with acids and aluminum salts of equal normality. Where good growth occurred the pH of the solution decreased. About the same toxicity was obtained with acids and aluminum salts of nitric, sulfuric, and

hydrochloric acids. Phosphoric acid showed less, and tartaric acid the least, toxicity.

With Shive's R_4C_3 nutrient at 0.025, 0.1, and 0.4 atmospheres osmotic pressure, and with varying H-ion concentration, greater growth was obtained with the stronger solutions. The ratio of growth of treated plants at the varying pH values to that of the check was approximately the same with the nutrient at all strengths. Wherever growth was made a lowering of the H-ion concentration was noted. This was in proportion to the size of the plants. In three series of cultures made with barley, rye, and dent corn in Shive's nutrient, with four corresponding degrees of H-ion concentration for sulfuric acid and for aluminum sulfate, it was found that sulfuric acid was more toxic at the same pH value than aluminum sulfate with this nutrient. In Hartwell and Pember's nutrient, containing less phosphorus in proportion to the other elements, and used in cultures with barley and rye at the same pH value of sulfuric acid and aluminum sulfate, aluminum sulfate proved to be much more toxic to barley than did the same H-ion of sulfuric acid. Rye was somewhat more injured by the aluminum salts than by the acid. This nutrient tends to become more acid with the growth of the plants.

It is concluded that the toxicity of aluminum salts is due more to the aluminum ion than to the H ion on such plants as barley, and that this toxicity is reduced when much phosphate is used. Acid soils are toxic to many plants largely because they contain easily soluble aluminum salts.

Some effects of sodium arsenite when used to kill the common barberry, E. R. Schulz and N. F. Thompson (*U. S. Dept. Agr. Bul. 1316 (1925), pp. 19, pls. 4, fig. 1*).—A review is given of the literature on arsenic, primarily sodium arsenite, in relation to its uses for weed killing, and the effects of arsenic when used for killing the common barberry are shown. Preliminary greenhouse experiments indicated that arsenious acid was the most toxic to the barberry, sodium arsenites less toxic, and of these the trisodium arsenite was the least toxic. In field practice 2 gal. of a solution prepared from 1 gal. of commercial sodium arsenite containing the equivalent of 8 lbs. of white arsenic and diluted with 40 parts of water were sufficient to cause the death of a single bush of the common barberry. The killing was effected within 3 to 7 days, and chemical analysis showed that the plants had absorbed arsenic in nearly all parts. Numerous other plants, including grasses and trees, were tested, and nearly all were killed by the solution, arsenic being found in their tissues.

Spraying the aboveground portions with a solution of arsenite identical with the one used for application on the roots showed that only the treated portions of the plants were killed, and then only in the case of tender plants. Soil treated with sodium arsenite is said to have shown moderately fast leaching, the arsenic content decreasing from 0.076 per cent at the time of application to 0.04 per cent after 14 months in well-drained soil under an annual rainfall of about 30 in. Various economic plants were seeded in this soil after leaching, and there was no inhibition of germination, although growth was affected.

Where sodium arsenite is used for the destruction of vegetation, the authors suggest precautions against accident to animals, as it was found that they would seek the arsenic treated plants and consume enough to kill them.

A modified volumetric method for determining small quantities of arsenic in plant tissue is described.

The effect of bacterial numbers on the nodulation of Virginia soy beans, A. T. Perkins (*Jour. Agr. Research [U. S.], 30 (1925), No. 1, pp. 95, 96*).—Experiments are reported in which soy bean seed was inoculated with known numbers of nodule-forming bacteria, after which the seed was grown for four weeks and the number of nodules on the roots determined.

The maximum nodulation was secured when the number of infecting organisms was between 25 and 50 per seed. A rather definite minimum number of nodular organisms was required to produce maximum infection, and after a certain degree of infection was reached the host was immune to additional infection.

Regarding the possible adaptation of soy bean radicicola to a specific host variety, A. T. PERKINS (*Jour. Agr. Research [U. S.], 30 (1925), No. 3, pp. 243, 244*).—Having noticed wide variation in the numbers of nodules occurring on the roots of different varieties of soy beans, the author carried on series of experiments in the greenhouse and field, which are said to indicate that the soy bean radicicola organism does not tend to become adapted to specific host varieties of soy beans. The differences in nodulation shown by the different varieties of soy beans are thought to be due to some physiological difference in the varieties, possibly a difference in the ability to conduct carbohydrates to the roots or proteins away from the roots.

GENETICS

The relative value of the processes causing evolution, A. L. and A. C. HAGEDOORN (*The Hague: Martinus Nijhoff, 1921, pp. [8]+294, figs. 20*).—The several sections of this book (following the introductory portion, which deals with historic attempts to account for the appearance of species) deal, respectively, with heredity, variation, crossing, reduction of variability, mutation, selection, species and varieties, the law of Johannsen, evolution in nature and under domestication, and the status of man. A bibliography, giving reference to about 112 titles, covers many aspects of this and related subjects.

Studies on the cytology of Melilotus alba, E. F. CASTETTER (*Abs. in Iowa Acad. Sci. Proc., 30 (1923), p. 331*).—Observations on the anatomy and cytology of the biennial variety of *M. alba* have been contributed by W. E. Rogers.[1] The present paper covers the cytology of the annual variety.

In material which was regarded as hybrid between the annual and the biennial variety, normal pollen grains were found, and others which were three or four times as large as the normal. The occurrence of an annual and of a biennial variety appears to be associated with the two kinds of pollen grains. The formation of the pollen grains from the pollen mother cells in the annual variety is said to correspond with their formation in the variety as reported by Rogers.

The assortment of chromosomes in triploid Daturas, J. BELLING and A. F. BLAKESLEE (*Amer. Nat., 56 (1922), No. 645, pp. 339–346, figs. 8*).—"The present article is one of a number of proposed papers which will deal with the behavior of the chromosomes in the different classes of Datura mutants, the correlation of the chromosomal differences with changes in structural and other characters, and with the ratios in which Mendelian allelomorphs are found in the offspring." The results are chiefly tabulated, with discussion.

"The random assortment of chromosomes in triploid Daturas parallels the conclusions as to the random assortment of genes in triploid (trisomic) inheritance, and adds to the evidence for the chromosomal theory of heredity given by the cytological and genetic work on . . . insects."

A chromosomal survey of certain plant families, with special reference to genetic relationships, M. G. CAMPIN (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 489*).—"In surveying an entire family from a chromosomal point

[1] *Notes on Melilotus alba, White Sweet Clover.* Iowa Acad. Sci. Proc., 24 (1917), pp. 415–423, pls. 2, figs. 3.

of view certain conclusions emerge: (1) Within the family a certain 'type form' of chromosomal configuration and cytological behavior is recognizable. (2) The actual number of chromosomes in the different genera and species is of less importance in indicating affinity than the 'type form,' although sets of series, e. g., 12, 24, 36 . . . 60 in the Solanaceae, are often observed and can be interpreted on a genetic basis. Solanaceae and Ranunculaceae are discussed in detail. Morphological and cytological relationships of types aberrant to these families are discussed, and the significance of polypoidy in the genealogy of species is considered."

A preliminary account of a survey of the chromosomes of the Liliaceae, N. FERGUSON (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 91 (1923), p. 489*).—"Variations in number, size, and form of chromosomes in the Liliaceae are illustrated. It is proposed to measure the size of the chromosomes—both linear dimensions and volume of chromatin—in the somatic and heterotypic divisions; also to compare in various species the variation in size of the chromosomes and the forms of some of the bivalents.

"The underlying idea of the research is to study the chromosome groups in relation to phylogeny, and to test how far we have here another character for determining affinities. Another aspect is a comparison of the chromosome complexes of the species of one area with those of another, widely separated area, in order to ascertain whether the constitution of the nucleus offers any indication of the lines along which development has occurred."

Histological studies on the gonads of the fowl.—II. The histogenesis of the so-called "luteal" cells in the ovary, H. B. FELL (*Brit. Jour. Expt. Biol., 1 (1924), No. 3, pp. 293–312, pl. 1*).—The results of the first portion of an investigation of the nature and function of the luteal cells in the ovaries of the fowl, conducted at the animal breeding research department of the University of Edinburgh, are reported. In pursuing this investigation histological studies were made of the ovaries of 22 female embryos from the seventh to twentieth day of incubation, 13 young pullets from 1 day to 3.5 months of age, 11 adult pullets, and the gonads of 8 fowls showing various stages of sexual reversal.

The development of the luteal cells through prenatal and postnatal life is described, and it was found that the formation of these cells in the case of sex reversal was a repetition of the embryological process. The function of the luteal cells was not clear from the morphological study, but the author concluded that they were nonsecretory in nature, being a result of a peculiar form of fatty degeneration of the sex cord tissue, and that they bear no relation to the mammalian corpus luteum. They are more likely homologous with the interstitial cells of the mammalian ovary. A high lipoid content of the blood may occur with the development of the luteal cells, due to the fatty degeneration of the sex cord. This may influence the production of hen feathering.

The previous study of this series has been noted (E. S. R., 50, p. 530).

The electrogenetic laboratory at Belgirate and the methods proposed by Alberto Pirovano, L. MONTEMARTINI (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 1, pp. 10–16, pls. 13, figs. 3*).—An illustrated article dealing with work in which, it is claimed, mutations were induced by exposing pollen to radioactive and electromagnetic treatments.

The origin of variations (*Amer. Nat., 56 (1922), No. 642, pp. 5–96, figs. 14*).—In a symposium held at the thirty-ninth annual meeting of the American Society of Naturalists, Toronto, December 29, 1921, contributions were made on Variation in Uniparental Reproduction, by H. S. Jennings (pp. 5–15); Variations in Datura Due to Changes in Chromosome Number, by A. F. Blakeslee (pp.

16–31); Variation Due to Change in the Individual Gene, by H. J. Muller (pp. 32–50); The Origin of Variations in Sexual and Sex-limited Characters, by C. B. Bridges (pp. 51–63); The Nature of Bud Variations as Indicated by Their Mode of Inheritance, by R. A. Emerson (pp. 64–79); and Serological Reactions as a Probable Cause of Variations, by M. F. Guyer (pp. 80–96).

A peculiar type of variability in plants, R. R. GATES (*Jour. Genetics, 13 (1923), No. 1, pp. 13–45, figs. 24*).—The present is in part a continuation of a former paper (E. S. R., 39, p. 123) which presented the results in F_1, F_2, and F_3 of reciprocal crosses between *Oenothera biennis* and *O. rubricalyx*, the present account dealing with the F_4 generation of this cross, and analyzing more fully the data already published for the F_2 and F_3 generations. The results, as regards petal size, differ from anything described previously in several ways. The various graphs show segregation, both germinal and somatic, without determining the precise relationship between the two phases. The evidence does not support an assumption of several fixed Mendelian size factors, and it is considered evident that the whole problem of the inheritance of cumulative size factors requires reexamination. It appears that in later generations the modes of petal length occur indifferently at any point, and the same is true of somatic segregation considered generally.

Viewed as variability, this behavior differs from fluctuation in two ways. A variety of curves may be obtained for different individuals, such curves seldom conforming to that of fluctuating variability. The condition is thought to have arisen through the failure of adjustment between different size tendencies inherited from the original cross. The disharmony expresses itself in petals of different sizes sometimes occurring in the same flower or more frequently in flowers of different size on the same plant. The frequent occurrence of slits in the petals appears to be due to mutual pressure in the bud producing these mirror-image phenomena. It is not a new germinal character, but is rather another result of disharmony. This type of variability stands between ordinary Mendelian inheritance on the one hand and fluctuations on the other, having certain features of both but differing from either in its irregularity.

Since Mendelian behavior is now generally admitted to be based upon the segregation of chromosome pairs in the reduction divisions, it is thought probable that the phenomena of variability and segregation here described are based partly upon cytoplasmic differences between the parental forms. It is thought inadvisable at present to consider Mendelian behavior as demonstrated in any case in which the F_2 can not be individually classified into distinct categories on the basis of their visible differences, unless clear evidence of the segregation of fixed units can be obtained from the F_3 or later generations.

The genetics of variegation in a fern, I. ANDERSSON (*Jour. Genetics, 13 (1923), No. 1, pp. 1–11, pls. 2*).—The variegated form of *Adiantum cuneatum*, long cultivated at the John Innes Horticultural Institution, originally multiplied by division and latterly giving variegated individuals from spores, showed in the latter growings a few white sporophytes among the variegated ones. The prothallia were considered to be all green, and were so described by Bateson (E. S. R., 47, p. 221). Since white ferns arose from prothallia, as well as variegated ferns, and the prothallia had appeared to be all green without variegation, the inference was drawn that genetic segregation had occurred in the haploid tissue of the gametophytes. It was later found that the prothallia, when examined as transparencies, often exhibit pale stripes, though appearing green on the soil. Examination of the phe-

nomenon was undertaken in 1921 by the present author, and the result of this fuller study has been to show that all the prothallia which are green and viable sooner or later develop pale stripes, and that all the green ferns arise from them and are viable eventually develop the characteristic variegation. This article gives an account of that work and its results in descriptive and tabular detail. However, only a preliminary study of the cytology has been made, though this was planned as a subject for later report.

Chimera in head of sunflower, T. D. A. COCKERELL (*Jour. Heredity, 16 (1925), No. 1, p. 2, fig. 1*).—In the sunflower illustrated, the florets in about a third of the entire disk show ligulate characters, as in the so-called double sunflowers.

A keelless cockerel: A skeletal defect in the domestic fowl, L. C. DUNN (*Jour. Heredity, 15 (1924), No. 7, pp. 307, 308, fig. 1*).—A cockerel lacking the bladelike ridge of the breastbone is noted from the Connecticut Storrs Experiment Station. No birds showing this abnormality were produced either in the F_1 or F_2 offspring of this bird mated with normals or with an abnormal female having a split breastbone.

Correlation between number of leaves and height of Nicotiana tabacum, P. A. DAVID (*Philippine Agr., 13 (1925), No. 8, pp. 345–348*).—Positive correlation was found between total number of leaves and height in the 14 sorts studied, but this exceeded 0.5 only in the case of San Antonio (0.514 ± 0.0496) and Improved Gold Leaf (0.588 ± 0.0401). The practical aspects are discussed briefly.

Inheritance of certain characters in Gossypium, K. I. THADANI (*Agr. Jour. India, 20 (1925), No. 1, pp. 37–42, pls. 3*).—The mode of inheritance of certain seed and lint characters of cotton is described from experiments made at the Texas Agricultural and Mechanical College. See also an earlier note on linkage (E. S. R., 50, p. 633).

Cotton seed were grouped as naked, partially fuzzy, and entirely fuzzy. The last group was subdivided into woolly, felted, and scanty fuzz. Naked seed as seen in No Lint upland cotton was completely dominant in F_1 over fuzzy seed of certain American uplands, differences being determined by a single factor pair. Both felted seed and scanty fuzz were dominant over woolly. Partially fuzzy seed, as found in Egyptian cottons and some Sea Island strains, were recessive in F_1 to the entirely fuzzy seed of American uplands, with several factors apparently involved. However, the partial fuzz in Yuma Egyptian was dominant over the upland type. In hybrids between No Lint and Lone Star, Texas Rust, Acala, and Red Leaf, high percentage of lint was dominant over low percentage, with only a single factor indicated. Long staple seemed to be dominant over short in F_1 of a number of hybrids.

New observations on the genetics of peas (Pisum sativum), C. PELLEW and A. SVERDRUP (*Jour. Genetics, 13 (1923), No. 1, pp. 125–131, figs. 4*).—This work dealt with the origin and properties of two new varieties of *P. sativum* showing respectively reduced stipules and keeled wings, with the genetics of yellow pod and of cotyledon color, and with two new linkage groups, bringing the number of accredited linkage groups in Pisum up to three.

Linkage in the sweet pea (Lathyrus odoratus), R. C. PUNNETT (*Jour. Genetics, 13 (1923), No. 1, pp. 101–123, pl. 1, figs. 6*).—Data are discussed in the present paper which have accumulated during 19 years, this work having been carried on during part of this period in connection with Bateson et al. (E. S. R., 14 p. 634; 17, p. 1159; 20, p. 1168; 21, p. 46; 28, p. 876).

It is stated that several fresh linkages were found, and that, although the number of independent groups had been fixed at eight, the data available did not in all cases exclude a low grade of linkage between certain of the

It is expected, from work to be done hereafter and from data thus far considered, that the number of linkage groups will eventually be found to correspond to the haploid number of chromosomes. Brief notes are given on the seven pairs of characters not previously described. The number of workable characters in Lathyrus hitherto not exploited is thought to be small.

The hybrids of wheat with Aegilops [trans. title], S. LEWICKI and B. DUTKIEWICZOWNA (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polon. Econ. Rurale Pulawy*), *4* (*1923*), *A*, *No. 4*, *pp. 328–340*, *pl. 1*).—To clarify the genetic relations between Aegilops and Triticum, *A. ovata* was crossed with *T monococcum*. Comparison of the characters of the F_1 plants with those of the parents showed those typical of Aegilops to dominate over those of Triticum. No genetic basis seems to exist for the inclusion of ovata into a genus distinct from Aegilops. The same reasons are lacking for denial of the relation between the form ovata and wheat.

Breeding work with henequen and sisal, R. VIDAL (*Jour. Heredity*, *16* (*1925*), *No. 1*, *pp. 9–12*, *figs. 3*).—Reciprocal crossings between henequén (*Agave fourcroydes*) and sisal (*A. sisalana*) made at Mayaguez, P. R., in the winter of 1922–23, gave negative results in sisal×henequén, whereas henequén ×sisal produced 14 pods from which 43 F_1 hybrid plants survived. Although scaffolding was required to reach the flowers on the flower stalks, which were from 5 to 10 meters (16.4 to 32.8 ft.) high, the operations of hybridization were otherwise comparatively easy.

The application of genetic principles in breeding poultry for egg production, F. A. HAYS (*Poultry Sci.*, *4* (*1924–25*), *No. 2*, *pp. 43–50*).—The author has reviewed the present knowledge concerning the genetic factors responsible for egg production with reference to winter production, sexual maturity, winter pause, rate of production, broodiness, and persistency, based largely on the works of R. Pearl, H. D. Goodale, and others.

FIELD CROPS

[Crop experiments in Maryland] (*Maryland Sta. Rpt. 1924*, *pp. VIII, IX, X*).—Varietal trials have indicated Dakota Red potatoes to replace McCormick, smooth wheat for the Piedmont Plateau and awned types for the Coastal Plain and western limestone valleys, southern prolific corn varieties for silage, and Virginia and Wilson soy beans. Planting tests suggest planting varieties of late potatoes the number of weeks before probable frost which the given variety requires for maturity and seeding soy beans for hay May 20 to June 10.

Experiments during several years showed that the yields of timothy and mixed hays may be increased 0.5 ton per acre by early spring application of from 200 to 300 lbs. of sodium nitrate per acre. Fall-seeded hay mixtures without nurse crops produce better quality and from 1 to 2 tons more hay per acre than when customarily seeded with a nurse crop, the timothy in the fall and the clover in the spring. Broadcasting the seed of the hay mixture on wheat stubble disked several times and then pressing the seed into the soil with a corrugated roller was found to be a good practice in seeding hay crops. In general the seed should be sown during the last half of August, preferably just after a good rain. A mixture of timothy 6 parts, alsike clover 5 to 6, and alfalfa 4 to 6 parts, to be seeded at the rate of 15 to 20 lbs. per acre, has proved satisfactory.

[Field crops work at the Raymond, Miss., Substation, 1923 and 1924], C. B. ANDERS (*Mississippi Sta. Bul. 224* (*1924*), *pp. 3–12*).—Cotton variety trials

during four years (E. S. R., 49, p. 222) recommend for hill land Mississippi Station Trice, Willis, Cleveland 54, Acala, and Miller, and for bottom and rich hill land Delfos, Lone Star 65, Mississippi Station Trice, Acala, and Miller. Whatley, Mosby, Cockes Prolific, Hastings, and Ellis varieties of corn are indicated for general use. A mixture of 300 lbs. of acid phosphate, 200 of sodium nitrate, and 100 of kainit has been outstanding in all fertilizer tests with cotton and is advised for the section.

Tillage and rotation experiments at Dickinson, Hettinger, and Williston, N. Dak., L. Moomaw (*U. S. Dept. Agr. Bul. 1293 (1925), pp. 23, figs. 3*).—The results of tillage experiments and crop rotations in western North Dakota during 16 years at Dickinson and 11 years each at Hettinger and Williston carried on in cooperation with the North Dakota Experiment Station are summarized. The progress of the work has been noted extensively (E. S. R., 45, p. 734; 48, pp. 224, 226). Most of the experimental results are said to agree very closely at these substations and to agree with results of similar work at other places in the northern Great Plains.

In general spring grains and corn have produced slightly higher yields with spring plowing than with fall plowing. At each substation most crops made their highest average yields on fallow. The increases over other methods were rather unprofitable, although fallow has a certain value in weed control and in aiding early seeding. Disking corn ground is cheaper than either spring plowing or fall plowing in preparation for small grain crops and has given higher yields. The value of corn in a rotation greatly exceeds that of the feed produced. Yields of wheat, oats, and barley were higher on disked corn ground than on spring plowed or fall plowed grain stubble, being not much below those on fallow. Corn grown on fallow gave more mature ear corn but less fodder at Dickinson, reduced the silage at Hettinger, and increased the fodder at Williston. Corn on fallow tends to mature later than when grown on either fall or spring plowed grain stubble. Disked potato ground equaled corn ground and was almost as good as fallow as a preparation for small grains.

Manure applied to fallow before plowing in the spring of the fallow year did not increase grain yields at Hettinger. Manure applied before corn increased the fodder yield about 25 per cent in a 3-year rotation at Dickinson, but it neither increased wheat nor oats yields in the second and third years. Seeding wheat on disked wheat stubble can not be condemned on the basis of these experiments. Plowing under green manure crops has not given profitable increases in the yields of grain crops immediately following or of other crops in the rotations over those in similar rotations containing fallow instead of green manure. No cumulative effect from the green manure was apparent, and a legume was of no more value than a nonlegume. Brome grass and alfalfa, the most productive perennial hay plants available for the area, are of doubtful utility in short rotations. An established stand should remain for several years rather than plowed up with the hope of benefiting succeeding grain crops.

Continuous cropping to wheat, oats, and barley on spring plowing and on fall plowing resulted in marked reductions in the yields of those crops, apparently because of weeds rather than of a decrease in the soil fertility. Continuous cropping to corn increased the yield of mature grain and of fodder at Williston and of silage at Hettinger and slightly reduced the fodder yield at Dickinson.

[Field crops experiments at the Dickinson Substation in 1922 and 1923], L. Moomaw (*North Dakota Sta. Bul. 189 (1925), pp. 5–42, 44, figs. 8*).—

Investigations continuing earlier work (E. S. R., 48, p. 224) included crop rotation and tillage experiments (see above), tests of flax-wheat mixtures (E. S. R., 51, p. 437), and variety trials with spring and winter wheat, winter rye, oats, barley (E. S. R., 53, p. 232), corn, flax, alfalfa, sweet clover, field peas, soy beans, perennial grasses, millet, proso, sorgo, potatoes, mangels, rutabagas, and carrots.

When plats of Marquis wheat were harvested beginning (July 30) between the milk and soft dough stages and at 3-day intervals until the grain was fully mature, the rust infection increased from 15 per cent of red rust on July 30 to 55 per cent on August 14, the final cutting. Threshed grain yields gradually increased up to the fourth cutting and then declined slightly. The weight per bushel increased gradually from the first until the final cutting.

Tillage and seeding tests indicated that flax may give the best results when seeded on or before May 15 on land tilled once or twice previously to kill weeds. Yields from later seedings may be greatly reduced unless weed growth is prevented by cultivation.

Yellow sweet clover proved more desirable than white sweet clover to sow with a grain crop, the white so seeded failing completely in the driest years. Both types of sweet clover and brome grass made higher seed and hay yields in rows than in close drills. The slender and crested wheat grasses made the best acre yields in close drills.

[Field crops] work of the Umatilla Reclamation Project Experiment Farm in 1920, 1921, and 1922, H. K. DEAN (*U. S. Dept. Agr., Dept. Circ. 342 (1925), pp. 7, 16–20, 23, 24, figs. 2*).—Experimental work with field crops is described as heretofore (E. S. R., 44, p. 136).

Cheat grass (*Bromus tectorum*), which continued to be the most serious weed in alfalfa, has been kept below 0.5 per cent by weight in alfalfa hay by thorough spring-tooth harrowing in the early spring, preferably during windy weather, and following just as the alfalfa begins to grow with a second harrowing where the grass is especially bad. Other serious weed pests were wild barley (*Hordeum jubatum*), sandbur (*Cenchrus tribuloides*), and dodder (*Cuscuta epithymum*).

With both alfalfa and corn on coarse sandy soil, the increase in yield per unit of manure was larger for light applications than for heavy applications. The yield increases were about the same in quantity for both crops, but, since the feeding value of alfalfa is higher than of corn fodder, manure applied to alfalfa gave larger returns than with corn. Larger yields of corn may evidently be obtained on sandy lands of the region by having corn follow alfalfa whenever possible.

The hardy northern alfalfa varieties, i. e., Grimm, Liscomb, Cossack, and Black Hills common start earlier in the spring than the southwestern varieties, Indian, Peruvian, and Chilean. In the fall northern alfalfas become dormant after the third crop, while the southern sorts make considerable growth during the cooler weather following the third cutting. Common local, common Kansas, Black Hills seed, and Turkestan led in 2-year average yields. The leading corn varieties in both fodder and ear yields were Colorado Giant Fodder, Hopi, Dependable Yellow Dent, Barry Golden Tip, and Winslow Squaw.

Tests in pots and in the field with commercial fertilizers for alfalfa are also briefly noted.

[Field crops experiments on the Belle Fourche (S. Dak.) Reclamation Project Experiment Farm, 1919–1922], B. AUNE and O. R. MATHEWS (*U. S. Dept. Agr., Dept. Circ. 339 (1925), pp. 12–21, 26–31, 36–39, fig. 1*).—Experiments with field crops during the period 1919–1922 continued those described earlier (E. S. R., 42, p. 336). Tests of corn varieties sorgo and [illegible]

flowers for silage, and seeding and pasturing trials with mixture of grass seed are reported briefly, with discussion of methods for establishing grass pastures.

Observations on crops in irrigated rotation experiments were similar to those in previous years, alfalfa showing no marked effect on the yield of crops that follow except where pastured by sheep or hogs. Grains after a cultivated crop gave better acre returns than when following alfalfa or grain. Application of manure showed a marked increase in the yield of sugar beets and potatoes but not of grains. Sugar beets following potatoes or corn gave uniformly good results, while sugar beets after grain crops without manure and after clover gave uniformly poor results. Except when grasshoppers were present in large numbers, alfalfa seeded in late summer after the grain harvest gave satisfactory stands. Such seeding produced a higher yield the first year after planting and was much more economical than spring planting without a nurse crop.

Tests during six years indicate that under irrigation the best yields of alfalfa seed are obtained from the first crop. It seems desirable to bring the alfalfa into bloom without too much vegetative growth, which can be done by delaying irrigation provided the season is dry. No material difference under irrigation was seen in the hay yields of eight varieties and strains of alfalfa tested. Baltic, Grimm, and Cossack alfalfas are preferred for seed production, although local strains of Black Hills alfalfa seem satisfactory for hay.

Dry farming in the region has been discussed earlier (E. S. R., 44, p. 227). Only two cultivated crops, corn and sorgo, have promised success on dry land in this section. Alfalfa and brome grass both grew well but demonstrated that they are not adapted to rotation use. Rotation to date has shown no cumulative effects from the different crops and crop sequences. Little difference exists between the several small grains either in their demands for moisture or in the yield of crops following them. Yields of crops after corn generally have been above the average. As yet no response has been shown to either the quantity or character of the green matter in green manure turned under. Crops after fallow have yielded higher than those in any other sequence, due primarily to moisture and not to fertility.

Comparison of cultural methods showed subsoiling or deep tillage to have no superiority over ordinary fall plowing. Where grain follows corn, yields on disked land have been as high as on land plowed in the spring or fall. Corn and sorgo have shown to better advantage on fall plowing than on spring plowing. Wheat on fallowed land has averaged 50 per cent more than wheat after small grain. Planting dry land to a 2-year rotation, corn or sorgo on fall plowing and oats on disked corn or sorgo ground, in most years has given net returns materially higher than the value of the land as pasture.

[Field crops work in Nigeria], T. G. MASON, G. H. JONES, C. H. WRIGHT, R. F. MARTIN, T. THORNTON, and J. R. MACKIE (*Nigeria Agr. Dept. Ann. Bul. 3 (1924), pp. 11–61, 64–79, 84–95, pls. 9*).—Investigations on Moor and Ilorin Plantations continuing earlier studies (E. S. R., 50, p. 828) are reported on, together with papers by T. G. Mason and G. H. Jones entitled A First Survey of Factors Inhibiting the Development of the Cotton Plant in Southern Nigeria, by C. H. Wright and T. G. Mason entitled Concerning Correlations Between Certain Soil Moisture Constants and Crinkle of the Cotton Plant, by R. F. Martin and T. G. Mason entitled Preliminary Report on the Improvement of American Cotton in Northern Nigeria, and by T. Thornton entitled Tobacco Curing Experiments at Ilorin, 1923–24.

Crop production in India, A. HOWARD (*New York: Oxford Univ. Press, Amer. Branch, 1924, pp. 200*).—Important problems encountered in investiga-

ing on the future progress of India. Part 1, entitled The Soil, deals with drainage and erosion, soil aeration, irrigation and water saving, and the nitrogen and alkali problems. Part 2, The Crop, is concerned with the economic significance of root development, varietal improvement, seed distribution, the fodder problem, the major field crops, fruit growing, and plant diseases. Part 3, entitled Organization, describes the ideal investigator and the organization of research.

Cultivated grasses of secondary importance, C. V. PIPER (*U. S. Dept. Agr., Farmers' Bul. 1433 (1925), pp. II+43, figs 38*).—Agronomic and botanical information, adaptations, and illustrations are given for 19 grasses of secondary agricultural importance in the United States.

Seed mixtures for temporary grass: Investigations conducted in Denmark and Sweden and observations on trials of a similar nature in progress at Aberystwyth, R. G. STAPLEDON and R. JONES (*Welsh Jour. Agr., 1 (1924), No. 1, pp. 60–98*).—Experiments with grassland in Scandinavia, particularly those reported on by E. Lindhard and by H. Witte, are reviewed for their bearing on similar investigations in progress in Wales (E. S. R., 52, p. 133).

Behavior of cotton planted at different dates in weevil-control experiments in Texas and South Carolina, W. W. BALLARD and D. M. SIMPSON (*U. S. Dept. Agr. Bul. 1320 (1925), pp. 44, pls. 5, figs. 10*).—During 1923, four successive plantings of cotton made at San Antonio, Tex., Charleston, S. C., and Gainesville, Fla., were treated for the control of overwintered weevils by removing and destroying early squares, followed by the application of calcium arsenate.

Formation of nodes during the seedling stage was found to be more rapid in the later plantings, resulting in a shorter interval between planting and the appearance of the first floral bud. The fruiting capacity of late-planted cotton equaled and sometimes exceeded that of the early-planted cotton. The large number of floral buds produced in later plantings was evidently due to the greater production of nodes on the lower fruiting branches. Slightly larger numbers of flowers were recorded on the late-planted cotton, although the early plantings produced more flowers during the first part of the flowering period.

In a separate late (May 12) planting at San Antonio, not protected against weevil, plants in hills 12 in. apart had larger individual fruiting capacities than unthinned plants, due to the production of more nodes on the fruiting branches. However, the difference in fruiting capacity was counterbalanced by the greater number of plants in the unthinned rows. More flowers were recorded from the unthinned cotton, and during the first half of the flowering period the unthinned rows produced flowers at almost twice the rate of the thinned rows. This planting seemed to have been late enough to avoid infestation from overwintered weevils during 1923.

Cotton in St. Vincent, L. H. BURD (*Trop. Agr. [Trinidad], 2 (1925), No. 4, pp. 79–81, fig. 1*).—Observations on the development of the cotton plant gave indications that in St. Vincent (E. S. R., 52, p. 132), and probably in other places where water is not controlled, the bolling rate or size of crop can not be forecasted accurately from flowering records because of variable losses by shedding, soft rot, and probably other diseases unforeseen. All that can be done with certainty is to state the beginning of the period of boll maturation and from the total number of flowers deduce a possible maximum. Examination of bolls from dated flowers suggested that a considerable variation exists in the mean maximum lint length from day to day. Depressions in the lint length are associated with excessive rainfall around 19 days after flowering.

and thus they can be forecasted by about 3 weeks. Holding separate the cotton picked during such a period of depression might enhance the chances of uniformity in the product.

Notes on the taxonomy of American and Mexican upland cottons, F. L. Lewton (*Jour. Wash. Acad. Sci., 15 (1925), No. 4, pp. 65–71*).—Review of early publications suggested that neither *Gossypium mexicanum* nor *G. siamense* is a suitable name for American upland cotton. For more than a century "Siam cotton" was a general name given to several species or varieties of West Indian cottons having tawny or brownish lint and to occasional white forms of these. No valid evidence seems to have been brought forward to indicate an Asiatic origin for American upland cotton.

Further uses of the Balls sledge sorter, L. H. Burd (*Empire Cotton Growing Rev., 1 (1924), No. 4, pp. 290–298, fig. 1*).—Statistical analysis of lint length in cotton is commented on, with the details of a new method of estimating the number of fibers per seed.

The breakdown of flax and similar fibre-strands during the preparing processes, Part I, G. F. New (*Jour. Textile Inst., 16 (1925), No. 1, pp. T1–T12, figs. 7*).—In a study of the breakdown of the fiber strands of flax, hemp, and similar materials during manufacture into yarn, first consideration has been given the breakdown of the fiber during passage from the spreadboard to the rove bobbin. Typical sorting curves show the relative proportions of different lengths of fiber strand present in hackled flax line and in various flax roves. Average flax line was found to suffer during preparing a mean breakdown to less than half the initial length, with a corresponding reduction in thickness. Development of a quicker method of sorting than individual measurement of the fiber strands is described, with curves showing the comparison of roves made from warp and weft flax, the effect of halving the fiber before spreading, and the effect of extra preparing.

Studies on the horse bean (Vicia faba L.).—I, The Vistula horse bean [trans. title], L. Kaznowski (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 4 (1923), A, No. 4, pp. 50–85, figs. 2*).—The botanical relations and agronomic characters of the Vistula horse bean are described from three years' comparison with other varieties of *V. faba* and genetic and biometrical studies. A French summary and bilingual tables are included.

The Vistula horse bean, grown in the regions bordering the middle Vistula, pertains to *V. faba minor equina* and can be subdivided into smaller units. Its seed are a grayish fawn in color. F_2 segregation of crosses with varieties having violet and green seed, respectively, showed these colors apparently due to single factors. The hilum may be black, gray, or light gray, but the black seems to predominate in this as in other varieties of *V. faba*. The black of the hilum depends on a single, evidently recessive, factor for its expression. About 10 per cent of the flowers showed open pollination. Hybrids with *V. faba major* are easily made, giving intermediate plants in F_1 and a gradation between the parents in F_2, which shows that these parents differ by numerous characters.

The beans can be spheroidal, more or less ovalized; oblong with obtuse extremities, slightly angular; or oval, slightly flattened laterally. These forms characterize the types more or less resembling *V. faba minor columbina*. An index $(L_1+L_3):L_2$, wherein L_1=length of seed, L_2 width, and L_3 thickness characterized form better than did the correlation coefficient of the dimensions.

The weight per 100 seeds, which averaged 55.7 gm., was heavier in moist than in dry years. Coefficients of correlation between this character and the total weight of beans per plant and the number of pods were $r_1=-0.107$, and

$r_2 = -0.156$, respectively. Length of stem, which averaged 98 cm., is more or less correlated with a series of other characters. Length of stem up to the first pod is held important in selection, being negatively correlated with the number of pods per plant, $r = -0.2$ to -0.9, according to variety and climate.

Tendency to formation of lateral stems appears only when all conditions favor the development of the main stem or under abnormal conditions. Lateral stems rarely produce mature seed and do not depress yields or weights per 100 seed. Number of pods varies widely depending on other characters; with length of stems, $r = +0.383$, and with number of stems $r = +0.963$.

A study of variability in the Burt oat, F. A. COFFMAN, J. H. PARKER, and K. S. QUISENBERRY (*Jour. Agr. Research [U. S.], 30 (1925), No. 1, pp. 1–64, pls. 9, fig. 1*).—To determine the nature and extent of variability of the Burt oat, detailed studies of spikelet disarticulation, floret disjunction, basal hairs, awns, and lemma color were made within a number of strains of Burt cooperatively at the Kansas Experiment Station and at the Akron, Colo., Field Station, U. S. Department of Agriculture. The literature of the Burt oat, concerned with its importance and distribution, description and classification, and inheritance of spikelet characters, is reviewed at length. The authors consider Burt oats as belonging to *Avena byzantina*.

Spikelet disarticulation in the Burt oat appears to breed as a simple monohybrid; the roughened type of base resulting from fracture, resembling that of *A. sativa*, seems dominant, and the base resulting from abscission and containing a prominent cavity seems recessive. Of the two types of floret disjunction in the Burt oat, the sativa or disarticulating form predominates. The byzantina or basifracture form in breeding behavior somewhat suggests a cross involving multiple factors. The development of basal hairs appears to be complex genetically. Abundant long hairs appear to be recessive. Several factors probably determine the breeding behavior of awns in this variety. The twisted awn behaves as a recessive, and breeds truer than and seems distinct genetically from the other awn types.

Of the lemma colors in the Burt oat, red seemed the most stable in breeding behavior. The dark browns and blacks tend to produce a high percentage of dark kernels and seem to have a similar genetic constitution. In these experiments parental kernels classed as white did not produce a high percentage of white progeny kernels.

Correlation was found to exist among floret disjunction and spikelet disarticulation, spikelet disarticulation and basal hairs, spikelet disarticulation and awns, lemma color and spikelet disarticulation, and lemma color and awns.

Burt oat has been shown to vary in many observable plant characters, such as habit of growth of the young plant, leaf color and leaf width, and time of heading and ripening. Distinct variants observed included one showing a chlorotic condition of the leaves, one having multiflorous spikelets (E. S. R., 50, p. 227), one with loose paleas, and the false wild forms.

The variation in the moisture and nitrogen content of the potato during growth and storage, T. W. FAGAN (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 110–113*).—Arran Comrade potatoes, grown near Aberystwyth, Wales, during 1922 and 1923, were planted in April and dug in October, when part of the crop was stored in a pit. Samples were taken monthly from June on in the field and from December on in storage.

The principal changes occurring in tubers during growth were a gradual decrease in moisture content and a corresponding increase in dry matter. Similarly the percentage of total nitrogen, excepting the June sample, rose

steadily. The protein: total nitrogen ratio, lowest in the June sample, gradually increased as the season advanced until at harvest it ranged from 15 : 45 to 58 : 42 per cent. During storage this ratio remained fairly constant, although a small increase in the percentage of dry matter and total nitrogen was observed.

Plant late potatoes on time, C. E. Cormany (*Michigan Sta. Quart. Bul.*, *7 (1925), No. 4, pp. 143, 144*).—From June 1 to 15 seemed to be the best time to plant late potatoes in lower Michigan. April and early May plantings gave higher yields but were liable to more damage from insects, heat, and drought, while late June and July plantings made light yields of small and immature tubers.

Yield and market quality of potatoes, J. W. Weston, B. W. Housholder, G. W. Putnam, and H. R. Pettigrove (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 146–149*).—Experiments with potatoes at the Upper Peninsula Substation demonstrated the merits of early June planting, green sprouting, and corrosive sublimate treatment for black scurf. Cultivation tests suggested working the land before the plants emerge to kill weeds between the hills commencing with deep cultivation close to the plants and gradually working shallower and farther away as the plants develop, leaving the ground comparatively flat.

Modern rye culture [trans. title], Opitz (*Landw. Hefte, No. 53–54 (1925) pp. 43*).—Practical information here presented concerns the agronomic characteristics of rye, its adaptation and place in rotations, fertility and cultural requirements, varieties, seed treatment, and harvest.

The time of harvesting soybeans for hay and seed, C. J. Willard (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 157–168, fig. 1*).—In a quantitative study at Ohio State University of the development of soy beans during the maturing period, equal areas of soy beans were cut weekly from bloom until complete maturity. Conclusions drawn from these tests and applicable to varieties of the determinate types with high seed production, such as Manchu Midwest, Ito San, and Mammoth, may be summarized as follows:

Although the greatest dry weight yield obtainable at one cutting is had by cutting when one-fourth the leaves appear yellow, difficulty in curing makes harvest for hay impractical at this stage. The maximum green weight is attained one to two week earlier than the maximum dry weight. The weight of leaves increases until the beans are well formed, remains nearly constant for about three weeks, and then falls rapidly. The percentage of leaves in the hay decreases steadily from blooming to full maturity. When the beans are well formed the hay contains about 60 per cent of leaves and when the beans appear half grown about 50 per cent. The weight of stems reaches a maximum when the beans are well formed and remains constant thereafter. The percentage of stems in the hay decreases until half the leaves have dropped and then increases sharply. The seed yield increases slowly at first, then very rapidly for one or two weeks, and then more slowly until maturity. About 40 per cent of the mature crop is seed. In practice, soy beans should be cut for hay from the time the beans are well formed until the beans are half grown.

Storage of sweet potatoes, H. C. Thompson (*U. S. Dept. Agr., Farmers Bul. 1442 (1925), pp. II+22, figs. 16*).—This is a revision of and supersedes Farmers' Bulletin 970 (E. S. R., 39, p. 538).

Effect of different degrees of soil moisture on the yield and composition of tobacco [trans. title], A. V. Otrygan'ev (*Inst. Opytn. Tabakovod. Gor*

Krasnodare (*Inst. Expt. Cult. Tabac. Krasnodar Gouv. Couban*) [*Pub.*] *22* (*1924*), *pp. 32*).—Platana-Arcadia cigarette tobacco was grown on sandy soil and on clay soil with water contents ranging from 2.5 or 5 to 80 per cent of their total water-holding capacities.

The maximum yield of dry leaves was obtained at about 60 per cent of the total water-holding capacity of the soils. The increases were nil or negligible from this point to the total capacity, beyond which additional water resulted in greatly reduced yield, especially on the sand. Tobacco suffered from lack of water much less on the sand than on the clay. Lack of water after flowering depressed the yields of leaves much more than lack of water before flowering.

Complete fertilizer noticeably increased the nitrogen and nicotine contents of the leaves of tobacco grown on the sandy soil. The carbohydrate content of the leaves varied inversely with the nitrogen and nicotine. Whether fertilized or not, the nitrogen and nicotine contents of the tobacco on light soils varied little in response to the degree of soil moisture. On clay soil the nitrogen and nicotine contents were higher in fertilized tobacco, and they mounted still higher in the presence of fertilizer in proportion to reduction of soil moisture. The amount of carbohydrates in the leaves on clay varied in inverse ratio to the nitrogen up to a certain point, whereafter increased applications of nitrogen produced no change.

[Tobacco investigations in Canada in 1923], F. CHARLAN, J. E. MONTREUIL, D. D. DIGGES, H. A. FREEMAN, and T. G. MAJOR (*Canada Expt. Farms Tobacco Div. Rpt. 1923, pp. 43, figs. 3*).—Continuing earlier work (E. S. R., 50, p. 537), varieties and hybrids were compared for yields, quality, and disease resistance at Ottawa and Harrow, Ont., and Farnham, Que. Fertilizer experiments at these points and in cooperation with growers were similar in scope to those already recorded. Seed bed studies, spacing and curing experiments, and the continuous culture of tobacco gave results generally substantiating previous findings.

The Hungarian Seed Control Station in Budapest, 1912–1922 [trans. title], G. LENGYEL (*Kisérlet. Közlem., 27* (*1924*), *No. 3–4, pp. 85–145*).—The report of activities during the period 1912–1922, given in German and Magyar, includes tabulations showing the total numbers of samples of seed tested annually, results of trials of sugar beet seed, and determinations of purity and germination of agricultural and miscellaneous seeds.

Destruction of moss on lawns, E. M. STRAIGHT (*Canada Expt. Farms, Sidney* (*B. C.*) *Sta. Rpt. Supt. 1923, p. 37*).—A 5 per cent solution of iron sulfate killed moss outright in heavily infested lawns without injuring the grass. Raking out the moss was also effective, whereas lime retarded and guano stimulated the growth of both grass and moss.

HORTICULTURE

[Horticultural investigations at the Canadian experimental stations and farms], W. S. BLAIR, J. G. TAGGART, W. H. GIBSON, and V. MATTHEWS (*Canada Expt. Farms, Rpts. Supts. 1923, Kentville* (*N. S.*) *Sta., pp. 15–41, figs. 2; Swift Current* (*Sask.*) *Sta., pp. 18, 19; 1924, Indian Head* (*Sask.*) *Farm, pp. 26–34; Scott* (*Sask.*) *Sta., pp. 26–35, figs. 2; Swift Current* (*Sask.*) *Sta., pp. 20, 21*).—As in the previously noted pamphlets (E. S. R., 52, p. 639), there are presented brief cultural and variety notes on a large number of vegetable, fruit, and flowering plants.

The clonal variety in horticulture, A. B. STOUT (*Jour. Hort. Soc. N. Y., 3* (*1924*), *No. 1, pp. 58–78, figs. 13; also in N. Y. Bot. Gard. Contrib. No. 262*

(*1925*), *pp. 58–78, figs. 13*).—Pointing out that nearly all the important fruits, certain root and tuber crops, and many families of perennial flowering plants are propagated asexually, the author discusses the advanutges and disadvantages associated with this form of reproduction. Among the conspicuous disadvantages are the possibility of transmitting virus diseases and the frequent occurrence of unsatisfactory pollination due to inherent defects and incompatibilities. It is suggested that the ideal plant for vegetative propagation should be self-fruitful, bearing perfect flowers which possess no structural or developmental adaptations that decidedly limit close-pollination at least and, preferably, self-pollination also, and the self- and close-pollinations should be compatible in fertilization to the point of producing fruit. It is suggested that plant breeders and nurserymen should carefully determine the characteristics of new varieties before disseminating them among the general public.

Frost protectors for early planting, R. P. Hibbard (*Michigan Sta. Quart. Bul., 7* (*1925*), *No. 4, pp. 150–153*).—Determinations of the dry weight of corn seedlings grown in the greenhouse under various types of plant protectors showed in every instance that these devices reduced photosynthetic activity. In one instance, that of corn plants covered with ordinary wrapping paper cones, the control plants, as determined by dry weights, were 56 per cent heavier. Oiling the paper increased light penetration to a marked degree. Arbitrarily placing the light intensity in the greenhouse as 100 per cent, the intensities beneath celluloid, glassine, light parchment, heavy parchment, oiled paper, medium parchment, and brown wrapping paper cones were found to be 91, 81, 71, 71, 64, 61, and 23 per cent, respectively. In outdoor tests, with ordinary light figured at 100 per cent, celluloid, glassine, medium parchment, light parchment and oiled or waxed paper were found to reduce the intensity of light 7, 8, 17, 20, and 24 per cent, respectively.

That the air beneath the empty cones set in the field was generally slightly warmer than outside air was shown in determinations made at various times during the day. The fact that in the late afternoon the air beneath the cones was cooler than the outside air is believed due to the inability of the slanting sun's rays (March) to warm the air nnder the cones equally as well as outside.

Utilizing five types of cones, namely, celluloid, glassine, light parchment, medium parchment, and waxed or oiled paper, as coverings for nearly set tomato plants, the author found that after two weeks' covering in nearly every case the plants beneath the cones were larger than the controls. The differential in temperature of the air due to covering was highest (3° C.) beneath the celluloid cones, while the air beneath waxed or oiled paper was no warmer than outside. Based on dry weights of the control and treated plants, none of the coverings yielded conditions of growth significantly better from a statistical standpoint than the open air. However, when compared in the usual way, the increases in dry weight of glassine, celluloid, and waxed paper covered plants were 17.6, 17.3, and 6.3 per cent, respectively, above the checks.

[Variety and fertilizer tests with vegetables at the Raymond (Miss.) Substation], C. B. Anders (*Mississippi Sta. Bul. 224* (*1924*), *pp. 12–16*).—Work with garden peas and snap beans indicated that 1,000 lbs. per acre of mixed fertilizer was more effective than 1,500-lb. applications, and that nitrate of soda is a better source of nitrogen for peas than is sulfate of ammonia. For garden beans there was found no appreciable difference between the two nitrogen-supplying materials.

Of five tomato varieties tested, the Gulf States Market was found most productive. Modifications in the proportions of potassium applied to tomatoes as a component part of mixed fertilizers indicated that potassium in moderate quantities has a beneficial effect on yields while in larger amounts it has a tendency to reduce yields and to deter maturity. Nitrate of soda was found the most effective of several nitrogen-supplying materials used for tomatoes. However, successful results obtained from combining several materials led to the recommendation that a 10–4–3 mixture be used, the nitrogen derived in equal parts from nitrate of soda, ammonium sulfate, and cottonseed meal.

Observations on the development of the root system of Allium cepa L., C. P. Sideris (*Amer. Jour. Bot., 12 (1925), No. 5, pp. 255–258, fig. 1*).—Observations at the University of California upon onion plants growing in water and soil cultures showed two definite stages of root development for each plant. The first set of roots was produced at the time of germination and functioned up to the time of bulb formation, and the second set, produced at the time of bulb formation, functioned until the death of the plant.

Fruit culture in North Dakota, A. F. Yeager (*North Dakota Sta. Bul. 188 (1925), pp. 23, pls. 14, figs. 4*).—Beginning with a brief discussion of the difficulties and peculiarities of fruit growing in North Dakota and outlining the various steps in the planting and establishment of fruit gardens in that State, the author describes the various fruits and nuts exotic and indigenous to the State, noting in particular those varieties which have shown merit despite the severe climatic conditions.

Self-incompatibility in wild species of apples, A. B. Stout (*Jour. N. Y. Bot. Gard., 26 (1925), No. 302, pp. 25–31, figs. 4*).—That certain individuals of wild species of apples resemble some cultivated varieties in being self-incompatible and requiring cross-pollination was indicated in studies carried on by the author at the New York State Experiment Station in the summer of 1924.

Of 14 species and subspecies examined, 8, namely, *Malus coronaria, M. ringo, M. ringo sublobata, M. pendula, M. prunifolia, M. prunifolia macrocarpa, M. sylvestris*, and *M. orthocarpa*, failed to produce any fruit from protected blossoms; 3 species, *M. baccata, M. arnoldiana*, and *M. sieboldii*, were weakly self-compatible; and 3, *M. toringo, M. malus*, and *M. sargentii*, were highly productive. Except in the case of *M. coronaria* (about 10 per cent) microscopic examinations showed high pollen germination, ranging from 75 to 90 per cent. In all cases, including *M. coronaria*, the germination was strong and vigorous. Exposed to open pollination all species were fruitful.

The author directs attention to the fact that, since the records were taken in most instances upon a single tree, and since wild apples are usually reproduced from seeds, the determinations obviously can not be applied to the entire species. This would be especially true in collections of species where the opportunity for cross-pollination is present and where fully self-incompatible trees would obviously have to be cross-pollinated in order to set any fruit. It is suggested that apple breeders pay particular attention to the obtaining of highly self-fruitful seedlings.

Fertilization of apple orchards in Maine, K. Sax (*Maine Sta. Bul. 322 (1925), pp. 8, pl. 1*).—Cultivated mature Ben Davis apple trees at the Highmoor farm showed no significant benefit either in yield or growth over a period of five years (1914–1918) from annual applications of a complete 5–8–7 fertilizer. However, in a more recent study in the same orchard, in which sod-grown trees were treated in 1923 and 1924 with applications of 6 and 12 lbs. of nitrate of soda about three weeks before blooming, there was found a distinct and rapid response to the fertilizer, both in an increased set and in the size of

fruits. The average yields per tree for 1923 were 0.6, 1.45, and 1.3 bbls., respectively, for the control, 6-, and 12-lb. nitrate of soda plats. It is believed that the lower yield on the 12-lb. nitrate trees was associated with a lower vigor at the beginning of the experiment. The results in 1924 were in general accord with the 1923 results.

Analyzed according to Student's method, the fertilizer plats were found in all cases to be significantly more productive than the checks, the odds being over 10,000 to 1 in three of the four comparisons. The application of nitrate of soda apparently increased the proportion of nitrogen in the carbohydrate-nitrogen ratio to a point of proper balance and maximum productivity. Even the 12-lb. application did not stimulate a sufficient vegetativeness to throw the trees out of bearing.

In general conclusion the author points out that the results conform with those attained in other parts of the country, indicating that there are two satisfactory methods of soil management for apple orchards, (1) clean culture and cover crops and (2) sod plus nitrate of soda. Applications of potassium and phosphorus showed little or no effects on yield.

Commercial strawberry culture, J. W. MORTON (*London: Ernest Benn Ltd., 1924, pp. 48, figs. 3*).—Herein is presented, in brief, concise form, information concerning varieties, culture, etc., for the English grower.

Profitable bush fruit culture, J. W. MORTON (*London: Ernest Benn Ltd., 1925, pp. 63, figs. 3*).—Containing general cultural information concerning the currant, gooseberry, and raspberry, this handbook is prepared primarily for the benefit of the English grower.

Winter pruning the black raspberry, S. JOHNSTON (*Michigan Sta. Spec. Bul. 143 (1925), pp. 3–22, figs. 5*).—Working in a 3-year-old Cumberland black raspberry plantation located near South Haven, the author found, as indicated in an earlier report (E. S. R., 52, p. 040), that moderately severe heading of the laterals during the dormant season not only had little or no deleterious influence on total yield, but materially increased the size of the fruits.

A record of the nature of the growth emanating from each bud on canes and laterals showed in the case of plants with short pruned laterals (3.9 buds) that a large proportion of the buds on the main canes developed into fruitful shoots. On the other hand, on canes with unpruned laterals averaging 28 buds nearly one-half the buds on the main canes developed into short growths, which soon withered. Thus short pruning of the laterals evidently stimulated the buds on the main cane into vigorous growth capable of bearing fruit, corroborating the conclusion of MacDaniels (E. S. R., 50, p. 37), that practically every bud on a black raspberry plant is a potential fruit bud capable, under favorable conditions, of producing fruit. Observations on the development of the laterals showed that severe pruning had approximately the same stimulating effect as in the case of the main canes.

Data on the fruit production of plants pruned in various manners showed that the higher the total number of buds on the entire cane the lower was the total number of berries per fruiting shoot and the smaller the individual berries. Since the average yield per cane of plants thinned to three canes was only 0.8 oz. greater than that (8.6 oz.) of four-caned plants, it is advised that thinning, except the removal of weak canes, is not a profitable practice. This was especially true since the increased yield of three-cane plants was due to an increased number rather than to size of berries. Thinning of laterals from five to three was also unprofitable, having no appreciable influence on the number of berries per fruiting shoot, and appreciably reducing the yield per cane and per plant.

Where the laterals of canes of approximately the same average diameter were pruned to 4-, 8-, and 10-bud lengths, the differences in total yield and in size of berries were negligible. Data taken on the yield and size of berries originating from shoots arising from different sections of the main canes and laterals of four-caned plants indicated a progressive decrease in the size of berries with ascension of the cane and the laterals. Berries borne on shoots from the basal buds of unpruned laterals were somewhat smaller than those from adjoining sections of the main cane. A distinctly positive correlation was found between the yield and size of fruits and the diameter of the canes, and also between the leaf area of the fruiting shoot and its productivity. Both correlations are believed to indicate the importance of maintaining black raspberry plantations in a vigorous vegetative condition.

In respect to the effect of pruning on the time of ripening, a distinct tendency was noted for short pruned plants to bear a larger percentage of early maturing berries and to yield pickings uniform in size. Pruning favored greater rapidity in harvesting. Records taken on new cane growth of pruned and unpruned plants showed no significant differences that could be associated with pruning treatments. Thinning apparently had some influence on new canes, as the diameter of new canes on three-cane plants averaged somewhat less than those of the four-cane plants. No beneficial effects were found from removing old canes immediately after fruiting. In fact it is recommended that, if not diseased, these be left as a temporary support of the young tender shoots.

Vine-growing in Roumania, I. C. TEODORESCU (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 1, pp. 35–57, pls. 6, figs. 17*).—A survey of grape growing in Rumania, discussing such items as soils, propagation, varieties, and the general importance of the indnstry.

The almond in California, R. H. TAYLOR and G. L. PHILP (*California Sta. Circ. 284 (1925), pp. 57, figs. 19*).—This, a revision of Bulletin 297 by the senior author (E. S. R., 39, p. 846), presents, in a like manner, general information concerning almond production in California. The subjects of pollination and pruning receive special consideration in light of the results of recent investigations.

The viability of date pollen, A. B. STOUT (*Jour. N. Y. Bot. Gard., 25 (1924), No. 292, pp. 101–106, pls. 2, fig. 1*).—Germination tests conducted in 1923 in collaboration with W. T. Swingle, at Pomona College and at the U. S. Department of Agriculture date garden at Indio, Calif., with 29 lots of date pollen one or more years of age, revealed among the thousands of pollen grains examined only three viable grains, and these are believed to have been fresh grains accidentally included. Old pollen which had been kept in sealed vacuum tubes gave no germination, while, at the same time, fresh pollen showed excellent viability. Viable pollen germinated readily on a 1 per cent agar with 3, 5, and 10 per cent of cane sugar. The possibility that old pollen might germinate upon the stigmas although unable to grow in sugar is deemed most unlikely in view of the absolutely negative results in sugar solutions. Date pollen was found capable of surviving over a considerable period, as indicated in tests on April 12 of pollen collected February 19 of the same year.

A note upon the propagation of the oil palm, Elaeis guineensis Jacq. [trans. title], V. GOOSSENS (*Bul. Agr. Congo Belge, 15 (1924), No. 4, pp. 677–693, figs. 10*).—A brief illustrated article dealing with the methods employed in raising palms from seed.

The improvement of Bulgarian oil-yielding roses [trans. title], T. NIKOLOV (*Spis. Zeml. Izp. Inst. B"lgarii͡a (Rev. Insts. Recherches Agron. Bulgarie), 3 (1924), No. 1, pp. 1–13, figs. 8*).—Five types of roses, two reds, including a double and a single, and three whites, including one large- and one small-

flowered double and one single, were selected from the general run of planting stock as being particularly desirable for propagation. The scanty seed production in the improved forms as compared with that of wild roses is believed to be the result of cultivation and asexual propagation over a very long period.

The pruning of shrubs, M. A. Blake (*New Jersey Stas. Circ. 176 (1925), pp. 8, figs. 4*).—Pointing out that the majority of flowering shrubs require regular pruning in order to maintain their beauty and vigor, the author discusses the principles of pruning shrubs, suggesting treatments for various well-known species.

FORESTRY

Ten years of management of the Cornell University woodlots, A. B. Recknagel (*N. Y. Agr. Col. (Cornell) Ext. Bul. 113 (1925), pp. 27, figs. 13*).—Information is presented upon the growth, annual cut, and general improvement upon systematically managed woodlots which at the beginning of the investigation, in 1914, were in a run-down condition. As lessons from the project the author suggests the following silvicultural practices: Avoid clear cutting, and seek natural regeneration by successive cuttings which remove about half the stand at the first cut and the remainder in one or two subsequent cuts when reproduction has been established. Grazing is fatal to hardwood reproduction and generally detrimental to the forest.

Tree planting [at the Belle Fourche (S. Dak.) Experiment Farm], B. Aune (*U. S. Dept. Agr., Dept. Circ. 339 (1925), pp. 22–26, figs. 3*).—Tests carried on in cooperation with the U. S. D. A. Forest Service indicated that, under local dry-land conditions, soil designed for forest tree planting should be prepared by growing a cultivated crop or, preferably, by summer fallowing the season preceding planting. The rows should be placed at least 24 ft. apart with trees 6 ft. in the row. Under dry-land conditions clean culture was found essential. Among species, the Russian white oleaster, white elm, red cedar, Siberian pea tree, honey locust, and hackberry were found most desirable.

Under irrigation the list of desirable trees includes the Russian white oleaster, white elm, honey locust, native cottonwood, jack and bull pines, and Caragana. The white and golden willows made excellent windbreaks when planted near water. In conclusion the desirability of tree and shrub plantings about the farmstead is emphasized.

Christmas tree plantations, A. K. Chittenden (*Michigan Sta. Spec. Bul. 145 (1925), pp. 9, figs. 3*).—Suggesting that the Norway spruce, because of its symmetrical, rapid growth and natural beauty, is the best species for use in the establishment of Christmas tree plantations in Michigan, the author discusses the growing of the tree, including planting of the seed, raising of seedlings, the superior value of from 4- to 6-year-old transplants, spacing, value of tillage, rates of growth under favorable environment, possible returns to the grower, etc.

Sowing and planting season for western yellow pine, W. G. Wahlenberg (*Jour. Agr. Research [U. S.], 30 (1925), No. 3, pp. 245–251, figs. 2*).—Investigations conducted at the Savenac Nursery, in Montana, with western yellow pine seedlings showed that this species has no such decided seasonal preferences for seed sowing as the western white pine (E. S. R., 52, p. 541). As in the case of the western white pine, there was practically no hold-over germination in fall sown seed, while in spring sown beds it reached as high as 28 per cent in a very dry spring, 1919. Furthermore, delayed germination resulted in weak plants which had to be sorted from the general stock. Tests showed

However, when comparisons were made between fall and spring sown seedlings for use as stock for fall planting, it was found that the spring sown seedlings were much superior both in respect to survival and in vigor and rapidity of growth. Tests with the same stock planted out in the spring showed only slight differences between the fall and spring sown material. An examination of seedlings resulting from fall and spring sowings showed that the tops of the fall sown plants were heavier in proportion to the roots than was the case with the spring sown material. The author believes that the increased transpiration of the larger top causes an increased draft upon the roots, which, in the case of fall planting, are unable to meet the moisture requirements and often succumb. In spring planting it is thought that new absorbing rootlets are probably formed quickly enough to overcome the transpiration handicap.

The pruning of Scotch pine in the Böda (Sweden) State Forest [trans. title], E. LUNDH (*Meddel. Statens Skogsförsöksanst. [Sweden], No. 21 (1924), pp. 49–100, figs. 23*).—Data obtained upon Scotch pine trees from which, for a period of several years, the side limbs were lopped in order to allow light to penetrate to the undergrowth showed a statistically significant larger height increase in the pruned than in the control trees. This stimulus to height accretion was evident 20 years after pruning ceased. The increase in diameter at breast height was found to have been significantly diminished by pruning, but, on the other hand, the form of the trunk was improved, the change in diameter from base to crown being much more gradual in the pruned trees. Computations indicated that a majority of the pruned trees were lower in volume, but this loss was partly offset by a larger proportion of high-quality lumber from the pruned trees. Coal tar applied to pruning wounds to prevent infection not only impeded healing but also caused wood discoloration.

Volume of sugar maple trees, A. K. CHITTENDEN (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 160, 161*).—Herein is presented a volume table for sugar maples ranging from 10 to 32 in. in diameter at breastheight and from 24 to 64 ft. in height, arranged in multiples of 8 ft.

Effect of height of chipping on oleoresin production, E. GERRY (*Jour. Agr. Research [U. S.], 30 (1925), No. 1, pp. 81–93, pls. 3, fig. 1*).—Preliminary investigations having indicated that low faces (10 to 16 in. per year) are advantageous in reducing scars, lowering lumber degrade, and maintaining sustained yields, a test was outlined in which three carefully matched groups of 20 long-leaf pines each, in the Florida National Forest, were chipped to 0.25, 0.5, and 0.75 in. heights, respectively. The trees in the 0.25-in. group not only produced the highest total yield of gum during the first year (1923) of the test, but also showed an earlier and more abundant wood formation and a greater amount of gum-yielding tissue. By July these trees showed nearly twice as many wood cells, including about three times as much summer wood and about twice as many resin passages formed and ready to function as did the trees in the 0.75-in. group. High chipping caused unnecessary waste by removing more than an essential amount of rich gum-bearing tissue before it had produced its maximum yield.

Microscopic examination of the number and location in the ring of the resin passages at the different heights in the face demonstrated that the early formed, comparatively short wound ducts are quickly cut away by high chipping. Low chipping not only permitted the longest maximum production per year, but also made possible the holding over of a reserve of this tissue to augment production during a part of the succeeding season. The 0.25-in. chipping gave a comparatively low yield early in the season, but in midsummer and fall, a time when severely worked trees frequently failed, these trees were producing as well and often better than those with 0.75-in. chips.

Report of the National Conference on Utilization of Forest Products (*U. S. Dept. Agr., Misc. Circ. 39 (1925), pp. [4]+100, figs. 29*).—This is a symposium of papers relating to various methods of overcoming wastes in the manufacture, curing, and utilization of timber. The opening paper, entitled Forest Thrift, by President Calvin Coolidge, outlines the present condition of the Nation's forest resources and stresses the need of universal interest and cooperation in the conservation of the Nation's forests.

The forest resources of Finland, Y. Ilvessalo (*Bank of Finland Mo. Bul., 1925, No. 2, pp. 21–28, figs. 6; abridged in Timber Trades Jour., Spec. No., June 24, 1925, pp. 33, 35, 37, 38, 39, figs. 5*).—Statistical data are presented upon the classification of forest lands, composition of the forests, proportion of age classes, growing stock, rates of growth, ownership, etc.

Tropical light weight woods, K. C. Hyde (*Bot. Gaz., 79 (1925), No. 4, pp. 380–411, pls. 3*).—Herein are presented the results of a detailed histological study of the woods of certain tropical American species, namely, *Heliocarpus popayanensis, H. appendiculatus, Apeiba aspera, Cordia heterophylla, Pachira barrigon, Cavanillesia platanifolia,* and *Wercklea insignis,* all of which produce lightweight timber. The wood of these seven species falls naturally into two distinct classes, laminated and homogeneous, the latter of which is deemed better adapted for insulation products.

P. barrigon, the wood of which is homogeneous, is considered a likely substitute for the wood of Ochroma, now used as an important source of insulating material. The tree grows rapidly, attains an immense size, and reproduces freely from cuttings. The species *C. platanifolia* produces the lightest known wood.

The study showed that lightweight woods are not essentially dissimilar to heavier dicotyledonous woods, differing chiefly in being composed of thinner walled elements with proportionally larger lumina, a characteristic which accounts for their light weight and low specific gravity. Species producing lightweight woods possess the common characteristics of very large leaves, soft in texture; thick, strong, and fibrous bark; and white or very light-colored wood.

DISEASES OF PLANTS

A biometric comparison of the urediniospores of Cronartium ribicola and C. occidentale, R. H. Colley (*Jour. Agr. Research [U. S.], 30 (1925), No. 3, pp. 283–291, figs. 4*).—The author calls attention to the difficulty of differentiating between *C. ribicola* and *C. occidentale* in their uredinial stages by ordinary visual inspection or low power microscopical examination. Both rusts are said to attack a large number of species of the genus Ribes, and it is considered desirable to determine, if possible, means for their recognition.

From an analysis of measurements on 3,000 urediniospores, it is claimed that the two species may be separated in the uredinial stage with practical certainty on the basis of spore size, shape, and wall thickness.

The composite life history of Puccinia podophylli Schw., H. H. Whetzel, H S. Jackson, and E. B. Mains (*Jour. Agr. Research [U. S.], 30 (1925), No. 1, pp. 65–79, pls. 4*).—The common rust of the May apple is said to be of interest on account of the sequence in the seasonal appearance of the spore forms. This has been attributed to the mycelium occurring perennially in the host plant.

The authors found no evidence of *P. podophylli* being perennial or systemic in the plant. The early crop of teliospores on bud scales, stems, and petals preceding aecia is said to arise directly from mycelium produced by basidio-

spores from overwintered teliospores and usually not accompanied by pycnia. The aecia which normally develop on the blade of the leaf also arise in a similar manner from the same source. Pycnia are usually found associated with aecia. The late or summer crop of telia is said to be produced on mycelium developed from infection by aeciospores. No evidence was found to indicate the repeating of the aecia in this species. Telia are said to develop in association with the aecial lesions and arise directly from the same mycelium. When mature leaves are infected telia may predominate over the aecia, with or without the development of pycnia.

The authors claim that *P. podophylli* exhibits evidence of being in an unstable or plastic condition as to life history, and the species is believed to be a form which is still exhibiting evidences of changes which may take place in the evolutionary development from the complex to the simpler forms of life history. It is suggested that the food conditions of the various tissues invaded may have an important influence on the spore form developed.

Further studies on the toxicity of juice extracted from succulent onion scales, J. C. WALKER, C. C. LINDEGREN, and F. M. BACHMANN (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 2*, *pp. 175–187*, *figs. 3*).—In a previous publication (E. S. R., 40, p. 843) the senior author reported on the toxicity of volatile substances in onion bulbs to the fungus *Colletotrichum circinans*. The present contribution gives further information on this subject as related to the general question of parasitism.

Spreading quality of protective sprays and its measurability by a new method [trans. title], F. STELLWAAG (*Nachrichtenbl. Deut. Pflanzenschutzdienst*, *3* (*1923*), *Nos. 11*, *pp. 85, 86*; *12*, *pp. 89, 90*).—Phases and figures of this work are detailed.

Chemical, physical, and biological properties of Bordeaux mixtures, O. BUTLER (*Indus. and Engin. Chem.*, *15* (*1923*), *No. 10*, *pp. 1039–1041*).—Discussion herein offered relates to fact and opinion as set forth by early and later writers in about 17 publications regarding Bordeaux mixtures.

The take-all disease of cereals and grasses caused by Ophiobolus cariceti (Berkeley and Broome) Saccardo, R. S. KIRBY (*New York Cornell Sta. Mem. 88* (*1925*), *pp. 3–45*, *pls. 3*, *figs. 4*).—A report is given of a study of take-all of cereals and grasses caused by the fungus *O. cariceti*. The disease is described at length, the etiology of the fungus and its response to environmental conditions are reported upon, and means for control are suggested.

The disease is known to occur in 18 counties in New York, and it has been definitely reported as present in Arkansas, Kansas, California, Oregon, Indiana, Tennessee, and North Carolina. Tests have shown marked differences in the degree of susceptibility of various varieties of wheat and that a considerable number of species of crosses are subject to infection. High temperatures and high humidity in the early spring are said to favor the disease, as do excessive nitrogen fertilizing, alkaline soils, and early fall planting. Control measures are based upon the influence of ecological factors and embrace rotations, drainage of low lying soils, modifying the condition of soils by increasing their acidity, and planting of less susceptible varieties. A bibliography of about 60 references is given.

Leaf blight of corn, S. MARQUEZ (*Philippine Agr.*, *12* (*1924*), *No. 10*, *pp. 453–458*).—Corn (*Zea mays*) grown in the Philippines, more particularly that raised from imported varieties, is very commonly attacked by a leaf blight fungus which is claimed to be *Helminthosporium inconspicuum*. Spores and conidiophores are formed on the older spots. Laboratory plants are more readily infected than are plants in the field. The fungus gains entrance not

only through the stomata but also by direct penetration of the leaf tissues. One type is produced of spores which vary in size and number of their septa. Conidia germinate by means of germ tubes, typically one at each end of the conidium. Spores germinate in two hours at a temperature of 31° C. The conidia remain viable for three months in the laboratory. Spores in soil can infect young plants. Wind probably acts as a spore carrier.

Corn root, stalk, and ear rot diseases, and their control thru seed selection and breeding, J. R. HOLBERT, W. L. BURLISON, B. KOEHLER, C. M. WOODWORTH, and G. H. DUNGAN (*Illinois Sta. Bul. 255, abridged (1925), pp. 99, pls. 6, figs. 40*).—This is an abridged edition of a more complete publication previously noted (E. S. R., 52, p. 245).

Study of the life history and ecologic relations of the smut of maize, A. A. POTTER and L. E. MELCHERS (*Jour. Agr. Research [U. S.], 30 (1925), No. 2, pp. 161–173, pls. 3, figs. 2*).—Attention is called to the frequent occurrence of corn smut in the western part of the Corn Belt in the United States and the failure to control the disease through the ordinary methods used for smut control. Studies were made of the mode of infection and the factors influencing it. Four seasons' study failed to indicate that moisture was a limiting or controlling factor in the occurrence of corn smut, and infection did not depend so much on the time of the season as on the stage of development of the host plant. A common method of infection was found to be the development of a virulent culture of the organism in moisture held in the axil of the leaf of a young plant. Such local cultures are said to be likely to produce other infections in adjoining nodal tissues and thus produce a pseudosystemic development of the disease.

The partial smut control where fungicidal sprays were employed is held by the authors to be due to host injury, resulting in a reduced vegetative activity of the plant, which also resulted in a lessened production of smutted tissues. Wherever smut was lessened by the use of fungicides, a reduction in yield occurred. Negative results were obtained in planting varieties of corn on several successive dates in an attempt to avoid infection. Some evidence of partial resistance to smut was observed, and it is thought probable that by inbreeding strains may be obtained which show considerable resistance to the disease.

Relative susceptibility of selections from a Fulghum-Swedish Select cross to the smuts of oats, G. M. REED and T. R. STANTON (*Jour. Agr. Research [U. S.], 30 (1925), No. 4, pp. 375–391, pls. 4*).—An account is given of the behavior of 92 F_3 families of a cross between Fulghum and Swedish Select oats to *Ustilago avenae* and *U. levis*. The parents of this cross varied widely in their susceptibility, Fulghum being resistant and Swedish Select susceptible. A large majority of the F_3 families showed a moderate or high degree of susceptibility. Twenty-five families were comparable in resistance to that of the Fulghum parent, and eight families possessed a susceptibility greater than that of Swedish Select. The F_4 selections from susceptible F_3 families all proved highly susceptible, whereas the F_4 selections from resistant F_3 families in general proved very resistant.

The selections appeared to behave in a similar fashion toward both loose and covered smuts. No correlation was found between morphological characters of the various selections and their susceptibility to the smuts. It is believed possible to obtain the desired combination of resistance to smut and other varietal characters of oats.

Wheat rosette and its control, H. H. MCKINNEY, R. W. WEBB, and G. H. DUNGAN (*Illinois Sta. Bul. 264 (1925), pp. 273–296, pl. 1, figs. 8*).—An account is given of investigations, carried on jointly between the Illinois, Indiana, and

Wisconsin Experiment Stations and the U. S. Department of Agriculture, of a disease of wheat known as rosette, which is said to occur in four counties in Illinois and three in Indiana, originally reported as the take-all disease of wheat (E. S. R., 41, p. 746). Subsequent studies have shown that *Ophiobolus graminis* is never associated with the rosette disease. Later the disease was attributed to a species of Helminthosporium (E. S. R., 47, p. 247; 49, p. 244), but the authors' investigations indicate that rosette is due to some other cause than *H. sativum*. Rosette is considered to be an unusual type of virus disease. The experiments reported upon have shown that the causal agent is soil-borne, and it may persist in air-dried soil for three years or more. The disease recurs every year when susceptible varieties of winter wheat are sown on infested soil, but it has not been noted in spring wheat.

Associated with rosette is a form of mosaic leaf mottling, and all varieties which are susceptible to rosette appear also susceptible to leaf mottling. In general, the mottling does not seem to interfere with the development of the plants.

The authors state that since the disease occurs in relatively few varieties it can be successsfully controlled by sowing those which are resistant.

An effective wheat pickling machine, A. J. PERKINS (*Jour. Dept. Agr. So. Aust., 27 (1923), No. 1, pp. 39–42, figs. 3; also in Agr. Jour. India, 19 (1924), No. 2, pp. 203–207, figs. 3*).—Difficulties in wetting completely the whole surface of the grains in treating wheat seed to guard against bunt are claimed to have been met successfully by use of a machine which is described as very simple in construction and operation. It is considered to be adapted to employment with solutions of copper sulfate or formalin, or even with a dry powder, as copper carbonate.

Study of Rhizoctonia blight of beans, C. C. NACION (*Philippine Agr., 12 (1924), No. 8, pp. 315–321*).—The observations and studies here outlined were made principally on young beans used as a cover crop and on soy beans planted on trial beds in the college fields. Supposedly only one Rhizoctonia, now claimed to be *R. solani* (though no perfect stage was found) is present on *Phaseolus lunatus* in the Laguna region of the Philippines. This fungus is said to attack locally all succulent plants that grow in mats, the resulting diseases being of the order of root or stem rots and damping off. This is said to be the most common seedling rot found in the islands, and to cause heavy losses by destroying whole fields of beans during the rainy season. Sclerotia fall to the ground and remain viable for long periods. Wet soil, damp air, and crowding favor and hasten the disease; air and sunlight retard its progress. Animals (as ants), wind, and water act as disseminators of the fungus. Inoculation experiments show that the organism can cause infection and wilting in one day.

Notes on cotton wilt in the southern Maratha country, G. L. KOTTUR (*Agr. Jour. India, 19 (1924), No. 2, pp. 155–159*).—Wilting of cotton plants at some growth stage occurs increasingly all over the southern Maratha country, being favored, supposedly, by lack of rotation. Apparently all American cottons but Sea Island are immune to the wilt organism, which is usually thought to be a soil-borne Fusarium. Steps are being taken toward the breeding of rust-resistant types of Kumpta cotton at Dharwar, and the present note gives some of the results thus far obtained with this and other strains, types, or varieties.

Diseases of the cotton plant in West Africa, R. SWAINSON-HALL (*Textile Mercury, 69 (1923), No. 1799, pp. 206, 207, figs. 7; abs. in Agr. Jour. India, 19 (1924), No. 2, p. 212*).—Short descriptions of the cotton diseases found in West

and Southwest Africa, with their causative organisms, include angular leaf spot (*Bacterium malvacearum*), wilt (*Neocosmospora vasinfecta*), anthracnose (*Glomerella gossypii*), soreshin (*Pythium debaryanum* ?), rust (*Uredo gossypii*), and two less serious troubles characterized by leaf spotting and shedding and due to *Ramularia areola* and *Mycosphaerella gossypina*, respectively.

Control of mycelial neck rot of onion by artificial curing, J. C. WALKER (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 4*, *pp. 365–373*, *pls. 2*).—The mycelial neck rot of onions, caused by an undescribed species of Botrytis, is said to be a common cause of heavy storage losses of onions, especially of white varieties.

The present paper is devoted to the results of studies of methods of handling the onion crop at harvest and in storage in relation to infection and to the control of the disease. When the removal of onion tops at harvest is practiced, it is claimed that the state of maturity of the plant has a direct bearing on the amount of infection. In the variety Red Globe the percentage of bulbs infected was doubled in the case of lots in which the neck tissue was still succulent at the time of harvest as compared with those in which the tops had matured properly. In general, in the case of colored varieties, the removal of the tops as compared with allowing them to remain intact after harvest usually resulted in greater infection. In the one experiment with the White Globe variety little difference was noted.

Artificial curing of onion bulbs sufficient to cause desiccation of the neck tissue within two or three weeks after harvest resulted in all cases in a material reduction in the amount of the disease.

Root rot of peas in the United States caused by Aphanomyces euteiches n. sp., F. R. JONES and C. DRECHSLER (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 4*, *pp. 293–325*, *pls. 6*, *fig. 1*).—In continuation of studies on the root rots of peas (E. S. R., 50, p. 839) an account is given of a root rot caused by *A. euteiches* n. sp., which is said to be much more important than that due to Fusarium. This disease is said to occur in nearly all important pea-growing districts of the United States with varying severity, depending largely upon the degree to which intensive culture of peas permits the accumulation of the fungus in the soil and upon the conditions of soil temperature and moisture favoring early infection and rapid decay of the invaded roots. The effect of the disease upon the appearance of the plant in the field and upon the yield of the crop is said to vary with the stage of development of the plant at which infection takes place and upon the number of infections. Inoculation experiments with pure cultures showed that infection may take place at temperatures between 10 and 30° C., but that the optimum temperature for development of the disease is approximately between 15 and 30°. Differences in soil moisture gave little difference in infection under the conditions of the experiments, while observations are said to indicate that the disease is more severe on soil with high moisture-holding capacity or on soil in which water is held by impervious subsoil or by subirrigation. The authors claim that the disease can be prevented and controlled most effectively by crop rotation, the length of rotation varying with local conditions.

A technical description of the fungus is given by the second author.

Further studies on the effect of environment on potato degeneration diseases, R. W. GOSS and G. L. PELTIER (*Nebraska Sta. Research Bul. 29* (*1925*), *pp. 3–32*, *pls. 7*).—On account of its bearing on field inspection of seed potatoes, the authors conducted investigations on the effect of environmental factors to determine their rôle in the masking of symptoms of some of the degeneration diseases. Potatoes were grown from cuttings of the same tuber

or from tubers from the same hill under control conditions in greenhouses which were repeatedly fumigated to eliminate possible insect carriers, and in temperature chambers previously described (E. S. R., 51, p. 847).

The experimental results indicate that light, soil moisture, and soil temperature have little or no effect upon the foliage symptoms of any of the degeneration diseases studied. High soil moisture and high soil temperature appear to increase the severity of the tuber symptoms of the spindle-tuber disease. However, high soil temperature was found to have a tendency to change the shape and color of the tubers of plants not affected with spindle tuber. The effect of air temperature on the foliage symptoms of the degeneration diseases was found to be very pronounced, and it is considered the most important factor studied in the inhibition or masking of foliage symptoms. In addition to the masking of mottling, wrinkling, ruffling, rugosity, curling, rolling, and brittleness in mosaic plants, it was found that spotting, streaking, burning, and leaf dropping on Bliss Triumph plants affected with rugose mosaic were eliminated at a temperature of 25° C. The symptoms of various mosaic diseases are said to have been more pronounced on the Green Mountain variety than on Bliss Triumph, and the masking effect at high temperature was not so great. Masking of symptoms was greatest at high temperatures with mild mosaic, while spindle-tuber symptoms were masked at low temperatures.

When mosaic and spindle tuber occurred on the same plant, the severity of the mosaic symptoms decreased, while those of spindle tuber increased, at high temperatures. As a rule the masking of symptoms was not as marked at high temperatures with combinations of degeneration diseases as with a single mosaic.

The authors report that the several and distinct diseases described by Schultz and Folsom (E. S. R., 50, p. 46) were found to come true to type by tuber perpetuation when the possibility of infection with other diseases the previous year had been eliminated. The addition of new disease symptoms occurred when plants were grown in the field subject to infection by insect transmission. The splitting up of combinations of diseases in different tubers from the same plant and also in different eyes of the same tuber was observed. Yellow dwarf is considered to be a disease distinct from the others studied. The temperature effect noted was the reverse of that occurring with mosaic. At 25° yellow dwarf was very severe, while at 15° no symptoms appeared.

The application of these results to field and experimental work with these diseases is discussed.

Distribution of potato canker in Germany, 1922 [trans. title] (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 3 (1923), No. 2, pp. 12–14, fig. 1*).—Potato canker distribution throughout Germany is indicated by map and by figures as tabulated for each geographical division. Infected areas in the neighboring territory are also named.

Overcoming the mosaic disease at Fajardo, R. A. Veve (*Facts About Sugar, 18 (1924), No. 20, p. 468*).—Sugar cane mosaic, or mottling, first discovered in the Fajardo section of Porto Rico in October, 1917, and combated at first ineffectively with chemicals and later effectively by means of roguing methods (E. S. R., 51, p. 50), is said to have been practically overcome in that section. Roguing is now considered the most practical of the methods thus far tested, and the percentage of the diseased stools has been reduced to 7.06 as compared with previous years.

Hot water treatment of sugar cane cuttings [trans. title], G. Wilbrink (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1923,*

No. 1, pp. 1–15; noted in Trop. Agr. [Trinidad], 1 (1924), No. 4, pp. 62, 63).—The best results, as regards freedom of the sugar cane stock from sereh after the hot water treatment, were obtained by exposure of the plant material for 30 minutes to water at from 45 to 50° C. (113 to 122° F.) and afterwards for 30 minutes at from 50 to 52 or 53°. In these cases no trace of sereh developed in the cane grown from the treated stocks. A somewhat larger percentage of the stocks survived the hot water treatment when the second application was kept at temperatures of from 50 to 52° than when they ranged as high as 53°. Practical considerations discussed, particularly difficulties, include applicability and cost of the hot water treatment.

Study of lethal temperature for Bacterium herbicola [trans. title], G. Bremer (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1924, No. 3, pp. 55–64*).—The work reported by Wilhrink (noted above) has been followed up, employing in part the extraction technique described by Von Wolzogen Kühr (see below). It was found by the present author that the temperatures lethal for *B. herbicola* depend in large part on the character of the culture media employed, varying in ways which are described.

Sugar cane root rot [trans. title], J. H. Coert (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1923, No. 7, pp. 291–307*).—A 2-year alternation gives greater opportunity for sugar cane root rot to persist than does a 3-year rotation. The likelihood of cane root rot in variety EK 28 is greater after late-ripening than after early-ripening varieties. On red (lateritic) soils, cane root rot seldom appeared.

Investigations regarding the microflora normally present in sereh-diseased sugar cane [trans. title], C. A. H. Von Wolzogen Kühr (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1923, No. 9, pp. 321–484, pls. 14*).—A systematic study is detailed as applied to sereh-sick sugar cane. A method is presented whereby cane sap may be obtained without contamination from the outside, and the application and results of this method are outlined. Extended study of the organism (commonly, but not always) associated with sereh shows this to be nearly related to *Bacterium herbicola aureum*, or possibly identical therewith. Study of the red coloration of the vascular bundles indicates the probable presence of a more or less toxic substance capable of producing necrobiotic changes. The colorant itself may be closely related to purpurin or identical therewith.

Phyllosticta leaf spot, fruit blotch, and canker of the apple: Its etiology and control, E. F. Guba (*Illinois Sta. Bul. 256 (1925), pp. 481–557, pls. 4, figs. 18*).—The results are given of detailed studies on the life history and means for control of *P. solitaria*, which is said to attack the fruit, leaves, trunks, and branches of apple trees. Tests of relative susceptibility of the fruit and bark to infection showed varietal differences, and in some cases it was found that certain varieties of fruit might be very susceptible while the bark was resistant to infection.

For the control of apple blotch the author recommends pruning and spraying. In pruning, he suggests the removal of crowded and dead branches and surplus water sprouts. All pruning should be done prior to the application of dormant spray. For the dormant spray, commercial lime sulfur 1–8, or copper sulfate 1–10, is recommended. The dormant spray is to be followed with two applications of lime sulfur at intervals of two and three weeks after petal fall, followed by three or four applications of Bordeaux mixture.

The spore discharge of the apple scab fungus in Delaware, J. F. Adams (*Delaware Sta. Bul. 140, (1925), pp. 3–16, figs. 4*).—The author reports considerable variation in the prevalence of apple scab in orchard sections of Kent

of the discharge of ascospores in relation to spring infection in the two regions, and the prevalence of the disease was found to be associated with ascospore discharge depending upon weather conditions. The heavier infection in Sussex County was found to be correlated with earlier maturity and discharge of ascospores.

From the standpoint of control, the author claims that the most important point of attack should be to lessen the possibility of spring infection. This is possible by means of leaf destruction and thorough protection to the developed leaves and fruit by fungicides. Overwintered leaves should be destroyed before April, and any overwintered leaves remaining should be sprayed when making the delayed dormant, pink, and petal fall applications of fungicides. Timely and thorough applications of efficient fungicides should be made for the delayed dormant, pink, petal fall, and two-week periods with a dependable spray outfit using not less than 200 lbs. pressure. When possible, applications should be made before periods of rain.

Spraying dewberries for anthracnose, W. C. DUTTON (*Michigan Sta. Spec. Bul. 144 (1925), pp. 3–13, figs. 2*).—The results are given of three years' experiments in the control, by spraying, of dewberry anthracnose caused by *Plectodiscella veneta*. A delayed dormant application of lime sulfur, 5–100, and 1 lb. calcium caseinate is recommended, to be followed about a week before the blooming period with Bordeaux mixture 4–8–100.

Fig smut, E. H. PHILLIPS, E. H. SMITH, and R. E. SMITH (*California Sta. Bul. 387 (1925), pp. 3–38, figs. 15*).—An account is given of an investigation of fig smut caused by *Aspergillus niger*. Preliminary reports on this disease have already been noted (E. S. R., 48, pp. 351, 542).

Court-noué [trans. title], P. VIALA (*Rev. Vitic., 60 (1924), No. 1550, pp. 211–213*).—Court-noué remains a puzzling problem as to the essentials of its causation. Though it appears under the operation of conditions so different as phylloxera and mildew, there is still a residue which is difficult to explain, though clearly characterized. No soil parasite has been determined in this connection. In certain localities indicated, this trouble has appeared in newly planted vineyards.

Court-noué [trans. title], L. RIVES (*Rev. Vitic., 60 (1924), No. 1558, pp. 341–349*).—A review is given of experimentation, deduction, and discussion, mainly by other contributors, regarding grape court-noué.

Root rot of the grapevine in Missouri caused by Clitocybe tabescens (Scop.) Bres., A. S. RHOADS (*Jour. Agr. Research [U. S.], 30 (1925), No. 4, pp. 341–364, pls. 7*).—A report is given of a mushroom root rot of grapevines, which is said to be of rather common occurrence in various localities in the Ozark section of Missouri. The fungus which is believed to be the cause of the disease is reported as *C. tabescens*, which has been reported in Europe and is considered the same as that described by Wilcox on fruit trees in Oklahoma (E. S. R., 13, p. 150). The root rot is said to be a disease associated with lands which formerly were covered by hardwood timber, particularly oak, and it is practically unknown in strictly prairie soils and in old land, except at the margins in close proximity to timbered lands.

Borax as a disinfectant for citrus fruit, W. R. BARGER and L. A. HAWKINS (*Jour. Agr. Research [U. S.], 30 (1925), No. 2, pp. 189–192*).—In order to obtain exact information upon the possibilities of controlling some of the common citrus parasites such as blue mold, *Penicillium italicum*, and green mold, *P. digitatum*, the authors carried on a series of experiments in which a number of common disinfectants were used in the wash water. The preliminary experiments indicated that boric acid offered very promising possibilities, and that alum was apparently of no value in such concentrations as could be safely

used in washing the fruit. Borax was later tested and found to be as effective as boric acid and much cheaper.

Other investigations, mostly under packing-house conditions, were carried on to test the efficiency of a 2.5 per cent solution of borax at various temperatures and at different methods of application. Valencia oranges were wounded, treated with borax, and inoculated with fungi, the treatment with borax consisting of the immersion in solution from 3 to 8 minutes, with a temperature ranging from 70 to 120°, after which the fruit was held in a warm room with high humidity. More decay was observed in the untreated fruit after one week than in any of the borax-treated lots. Inspections made two weeks after treatment showed some increase in the amount of blue mold in the treated fruit, but in no case where the fruit was treated at 120° for 8 minutes was there more than 5 per cent blue mold. In the case of green mold, this fungus was not regularly controlled by treatment with the same concentration of borax.

As a result of their investigations the authors believe that blue mold, which causes so much damage to citrus fruit in California, can be largely controlled by treating the fruit with a solution of borax. Further experiments on a commercial basis, to determine the value of the treatment, are required before definitely recommending the process.

Chrysanthemum yellows: A new disease in the greenhouse, R. Nelson (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 157–160*).—A description is given of a disease of chrysanthemums, which has recently been observed in greenhouses. The disease is said to somewhat resemble the yellows of asters. It is said that it can be recognized with certainty only at flowering time, because of the obscure nature of symptoms on other parts of the plant. The affected flowers, regardless of the normal color of the variety, are usually of a sickly green color. The cause of the disease is unknown, but it is believed to be of the same nature as the mosaic disease described on many plants.

For the control of chrysanthemum yellows, cuttings should be taken only from plants which do not show any indication of disease, and the greenhouse should be protected against insects which may aid in the spread of the trouble.

Tulip blossom blight, F. L. Stevens and O. A. Plunkett (*Illinois Sta. Bul. 265 (1925), pp. 297–307, figs. 8*).—A description is given of a disease of tulips that is attributed to *Phytophthora cactorum*. The flowers are attacked, and the flower stalk withers and falls over. The infection is usually through the flower, although the flower stalk and leaves may be directly attacked. Double tulips are said to be more subject to the blight than single ones. Moisture appears to be an important factor in the occurrence of the disease. Inocculation experiments with cultures of the organism showed that iris flowers were susceptible, and a damping-off of flax and sugar beet seedlings was brought about. The avoidance of situations that are especially humid is suggested as the only means for control.

The gray bulb-rot of tulips caused by Rhizoctonia tuliparum (Klebh.) n. comb., H. H. Whetzel and J. M. Arthur (*New York Cornell Sta. Mem. 89 (1925), pp. 3–18, pls 8, figs. 6*).—An account is given of a disease of tulip bulbs that was observed in New York in 1922. The disease is considered the same as that described from Germany by Klebahn as due to *Sclerotium tuliparum* (E. S. R., 18, p. 847). The investigations of the authors have convinced them that the fungus is a Rhizoctonia and that the name should be *R. tuliparum* n. comb. Much of the information regarding this disease is drawn from reports by European investigators. Steam sterilization or treating the soil with formalin gave satisfactory control. Some evidence was secured that is believed

to show resistance or immunity on the part of some bulbs, indicating the possibility of developing resistant or immune strains of tulip varieties.

Direct inoculation of coniferous stems with damping-off fungi, A. RATHBUN-GRAVATT (*Jour. Agr. Research [U. S.], 30 (1925), No. 4, pp. 327–339, figs. 2*).—The author claims that most reports on damping-off fungi have been based on field observations or upon experiments in which inoculum was added to the soil at the time the seeds were sown. The present paper gives the results from direct inoculation of coniferous stems. Seedlings of *Pinus resinosa*, *P. banksiana*, and *Picea engelmanni* were inoculated with more than 100 strains of fungi, most of which were *Pythium debaryanum*, *Corticium vagum*, and *Fusarium* spp. The most virulent parasites were *P. debaryanum*, *Botrytis cinerea*, *Rheosporangium aphanidermatus*, and *F. sporotrichioides*. The virulence and variability of the different fungi were found to depend somewhat on the substratum on which they had been grown. The time elapsing between inoculation and damping-off was especially short for the virulent rapidly growing fungi.

Control of decay in pulp and pulp wood, O. KRESS, C. J. HUMPHREY, C. A. RICHARDS, M. W. BRAY, and J. A. STAIDL (*U. S. Dept. Agr. Bul. 1298 (1925), pp. 80, pls. 20, figs. 5*).—On account of the rather serious losses in stored wood and wood pulp, the authors made a study of the cause of decay in wood and wood pulp and the conditions which favor it, mill tests and laboratory investigations being made of the same material.

The principal changes produced by fungi are shown by marked increases in constituents soluble in hot and cold water and in alkali, indicating changes in the character of the cellulose from a resistant to a less stable form. Lignin did not appear to be destroyed in any appreciable amount. Under storage conditions deterioration was found to be often severe, particularly with ground wood, and this is said to be due to molds and wood-destroying fungi. The molds, though not affecting the strength of the pulp, discolored it and frequently bound together the pulp particles so that the molded spots or areas did not beat up well, and lumpy speckled paper resulted. The wood-destroying organisms were found to decrease the strength of the wood fibers and rendered them so brittle that they broke into short lengths in the beater, with the result that most of the pulp was lost and the manufactured paper had little strength.

To combat deterioration of pulp during storage, the authors claim that careful attention must be given to the elimination of sources of infection. The most feasible method of controlling deterioration in pulp during storage, in addition to precautions against infection, is said to be the introduction of an antiseptic into the pulp on a wet machine, and the chemicals found best adapted to this purpose were borax, boric acid, a solution of naphthalene in crude cymene, sodium fluoride, sodium dinitrophenolate, and sodium dichromate.

In the appendix the authors give the results of studies of the fungi which inhabit pulp. The principal chemical damage done to pulp is attributed to the hymenomycetous fungi rather than to the molds, and 16 species were isolated, only one of which was completely indentified. The various fungi are described, and a scheme is presented for the classification of the fungi, based on the color reactions of the pulp infected by them.

The results are also given of an extensive investigation on the chemical action of fungi on ground-wood pulp.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Handbook of animal enemies of the field, garden, etc., F. W. Maier-Bode (*Taschenbuch der Tierischen Schädlinge in Feld, Garten, Speicher, Haus, im Obstbau und im Weinberg. Munich: J. F. Schreiber, 1924, pp. 163, pls. 38, figs. 14*).—This is a practical account dealing particularly with the more important insects. Mammal and avian pests are briefly considered. The work includes 38 plates illustrating the several stages of the pests and their injury, all but 8 of which are in colors.

The struggle against scorpions [trans. title], E. Dias, S. Libanio, and M. Lisboa (*Mem. Inst. Oswaldo Cruz, 17 (1924), No. 1, pp. 5–44, pl. 1*).—A discussion of the means of combating the scorpion pest in central Brazil.

Investigations of the life history of Brazilian trematodes.—I, Echinostomidae [trans. title], A. Lutz (*Mem. Inst. Oswaldo Cruz, 17 (1924), No. 1, pp. 55–93, pls. 8*).—This deals with 16 forms of Echinostomidae.

A preliminary catalogue of the Brazilian species of trematodes [trans. title], L. Viana (*Mem. Inst. Oswaldo Cruz, 17 (1924), No. 1, pp. 95–227*).—This synonymic catalogue of 241 forms is supplemented by systematic indexes of the trematodes of Brazil and of their hosts and an index alphabetically arranged. A bibliography of 36 pages is included.

Frogs as insect collectors, S. W. Frost (*Jour. N. Y. Ent. Soc., 32 (1924), No. 4, pp. 174–185, pl. 1*).—This account includes tabulated data on the larvae and adult insects and Arachnida collected from the alimentary canals of frogs.

Insects: Their structure and life, G. H. Carpenter (*London: J. M. Dent & Sons, Ltd., 1924, 2. ed., rev., pp. XI+335, pls. 4, figs. 184*).—This is a revised edition of the work previously noted (E. S. R., 11, p. 272).

The dissemination of insects by air currents, E. P. Felt (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 152–158*).—This discussion includes a reference to the work with balloons, previously noted (E. S. R., 51, p. 552).

The commercial development of biological control in California, H. S. Smith (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 147–152*).—A discussion of the status of this work in California.

Non-arsenicals for chewing insects, S. Marcovitch (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 122–128*).—This paper relates to experimental work with sodium fluosilicate and other compounds, particularly against the Mexican bean beetle, a detailed account of which has been noted (E. S. R., 52, p. 555).

Further data on the use of calcium cyanide as a greenhouse fumigant, C. A. Weigel (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 137–141*).—In continuation of the investigations previously noted (E. S. R., 51, p. 357), fumigation experiments conducted during 1924 on *Myzaphis* sp. on rose, *Aphis rumicis* on nasturtium, and *Macrosiphoniella sanborni* and *Rhopalosiphum rufomaculata* on chrysanthemum resulted, in most of the tests, in 100 per cent mortality when 0.25 oz. of calcium cyanide for each 1,000 cu. ft. of space was used overnight. Other tests gave similar results with the green peach aphid on carnations, the pea aphid on sweet peas, and *M. sanborni* on chrysanthemums. A 1-oz. dosage in orchid houses killed 100 per cent of the Boisduval scale (*Diaspis boisduvalii*) and 52 per cent of the chaff scale (*Parlatoria proteus*) without injury to the flowers. Calcium cyanide gives off its gas rather slowly and may require longer exposure than sodium cyanide, but it is easier to use and, for that reason, may be more generally adopted by florists.

Egg-killing washes, A. H. Lees (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 2, pp. 104–112*).—The use of lime sulfur at all strengths, with and without calcium caseinate, failed to destroy the eggs of *Aphis pomi* L. Tar distillate washes

gave generally good results, the method of testing being accurate enough to show the effect of a difference of 2 per cent in strength. Whether early or late applications of tar distillate washes are the more effective was not determined. owing to the apparent difference in the viability of the eggs. Commercial cresylic acid made up with soap as a wet spray and as a dust failed to destroy the eggs.

[Applied entomology in Canada] (*Quebec Soc. Protect. Plants, Ann. Rpt., 16 (1923–24), pp. 24–56, 60–72, 96–116, 138–145, pls. 10*).—Papers presented at the annual meeting of the Quebec Society for the Protection of Plants held at Ste. Anne de Bellevue, Que., in April, 1924, include the following: The Development of Applied Entomology in Canada, 1914–1923, by A. Gibson (pp. 24–56); Entomological Teaching in Its Relation to Farm Problems, by W. H. Brittain (pp. 60–66); The Orchard Entomologist, by W. A. Ross (pp. 67–72); The Life History, Habits, and Control of the Lesser Oak Carpenter Worm [*Prionoxystus macmurtrei* Guer.-Men.], by C. B. Hutchings (pp. 96–114); A Fruit Worm (*Graptolitha laticinerea* Grote) and Its Control, by C. E. Petch (pp. 114–116); and Indices to the Preliminary List of the Insects of the Province of Quebec, I, II, by E. Roy (pp. 138–145), which includes the Lepidoptera and Diptera.

Sugar cane insects in Louisiana in 1924, T. E. HOLLOWAY and W. E. HALEY (*Facts About Sugar, 20 (1925), No. 4, pp. 82, 83, 85*).—This is a brief account of investigational and control work in Louisiana in 1924.

Estimating forest insect damage and progress report on other forest insect studies, H. B. PEIRSON (*Maine Forest Serv. Bul. 3 (1924), pp. 22, figs. 3*).—This report has been prepared with a view to aiding foresters and timberland owners in estimating the condition of the timber on their holdings.

The organized co-operative campaign against grasshoppers in Wisconsin, A. A. GRANOVSKY (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 73–83*).—Cooperative control measures for grasshoppers on a large scale in Wisconsin are described. Sawdust was used as the base of a bait with no bran or middlings, and all attractants were abandoned except salt and molasses. The value of molasses is considered by the author to be doubtful. Sodium arsenite as a killing agent was found to be superior to white arsenic, being cheaper, perfectly soluble, quick in its action, and much easier to mix uniformly with other materials in the bait.

The elegant grasshopper (Zonocerus elegans Thunb.), C. P. VAN DER MERWE and C. C. KENT (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 1, pp. 29–42*).—This is a summary of information on this grasshopper, which feeds on a great variety of plants, but is largely a pest of orchards, vegetable and flower gardens, and of cotton.

Control of woolly aphis, C. FRENCH, JR., and L. PILLOUD (*Jour. Dept. Agr. Victoria, 22 (1924), No. 12, pp. 725–727, figs. 7*).—In experiments conducted by the authors in 1923, nicotine sulfate spray failed to give satisfactory results on badly infested 10-year-old trees, while a combination spray of nicotine sulfate 1 pint, red oil 1 gal., soap 1 lb., and water 80 gal. to 100 trees destroyed all the aphids. The parasite *Aphelinus mali* has been introduced into Victoria from New Zealand.

Control of aphids on nursery stock, A. L. PIERSTORFF (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 227–230*).—Through the use of nicotine dust on a commercial scale, the apple aphid, *Aphis sorbi*, the black cherry aphid, and *A. spiraecola* were successfully controlled. Cross transfers of *A. pomi* and *A. spiraecola* on apple and *Spiraea vanhouttei* were equally successful, and the author concludes that the two forms represent the same species.

The efficiency of various spray and dust mixtures in controlling the rosy aphis, P. J. Parrott and H. Glasgow (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 214–218*).—In work at the New York State Experiment Station, it was found that lubricating oil emulsion, wettable sulfur with nicotine sulfate, and nicotine dust (2 per cent nicotine) controlled the rosy aphid (*Anuraphis roseus*), although none of these preparations were quite so effective as lime sulfur with nicotine sulfate, which is the standard treatment.

The natural enemies of the citrus aphid, Aphis spiraecola (Patch), F. R. Cole (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 219–223*).—In this preliminary report on the natural enemies of *A. spiraecola* in Florida, it is stated that several predacious insects are of some value in checking the pest. No true parasites were observed by the author. In colonies on the native host plant, *Spiraea* spp., only two small predators were noted, a coccinellid beetle and an agromyzid fly.

The control of aphids which infest cauliflower seed beds on Long Island by means of tobacco dust mixtures, H. C. Huckett (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 128–132*).—The serious injury to the cauliflower industry on Long Island caused by the green peach aphid and the potato aphid led to the investigations here reported. Several insecticides thought to give satisfactory results in killing the aphids, notably nicotine sulfate solutions, soap solutions, and nicotine sulfate dusts, under practical conditions failed to give satisfactory control. The author finds that nicotine dust hydrated mixtures effectively control the aphids when applied to the seedlings.

"The advantages of this method of treatment are (1) cheapness and simplicity of application, namely, by hands, (2) the limited number of applications necessary (weather permitting), namely, two or three. The disadvantage of the method is the necessity for heavy applications of the mixture, which entails a higher cost of material than in the case of nicotine sulfate sprays or dusts. Tobacco dust mixed with hydrated lime in equal proportions by weight has resulted in as efficient control as less diluted mixtures. The tobacco dust as used in the experiments was of 200-mesh fineness and of 1 per cent nicotine content."

The influence of temperature and humidity upon the development of Myzus houghtonensis Troop, D. M. DeLong and A. A. Mathewson (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 172–176, fig. 1*).—Life history studies of the Houghton gooseberry aphis, officially known as the gooseberry witch-broom aphid, in Ohio show a decided variation in the development and length of life cycle of individuals in different generations. Climatic factors seem to affect this development. A high humidity and a low temperature apparently retard development very greatly. High temperature and low humidity seem to accelerate development. Most rapid development occurred when the temperature curve was above the humidity curve.

The rice root aphis (Dryopeia hirsuta A. C. Baker), J. P. Tan (*Philippine Agr., 13 (1924), No. 7, pp. 277–288*).—This contribution from the Philippine College of Agriculture reports the results of investigations of the life history, habits, and control measures for *D. hirsuta*, which was first observed in Los Banos by Baker about six years ago (E. S. R., 45, p. 860). While it has not been reported as causing serious injury, it is often associated with the roots of upland rice and certain other grasses. It is also known to occur in Tainan, Taiwan (Formosa).

Classification of scale insects of the subfamily Ortheziinae, H. Morrison (*Jour. Agr. Research [U. S.], 30 (1925), No. 2, pp. 97–154, pls. 2, figs. 42*).—This is a report of a systematic study of Coccidae of the subfamily Ortheziinae.

Only a single species, the so-called greenhouse Orthezia, has attracted attention in the United States as a scale pest of major importance. However, the presence of a relatively large number of species in the Southwestern States and the potentially wide host range indicated for the subfamily by the known host records, combined with the marked increase in agricultural development in this region in recent years, suggests the possibility that other members may take on a new economic importance. Forty forms of the subfamily, including eight here described as new, are recognized, and the genus Mixorthezia is erected. Keys to the genera and subgenera are followed by descriptions of the forms.

Mild typhus (Brill's disease) in the lower Rio Grande Valley, C. G. SINCLAIR and K. F. MAXCY (*Pub. Health Rpts.* [*U. S.*], *40* (*1925*), *No. 6*, *pp. 241–248, fig. 1*).—The authors report the occurrence during the summer of 1924 of what appeared to be mild typhus fever, known as "tabardillo," in the lowlands of the Rio Grande Valley. Since the body louse does not survive for a sufficiently long period of time in the warm climate of the lowlands and is not sufficiently ubiquitous to act effectively as a vector, the authors consider it quite probable that the head louse is the vector responsible for the transmission of the mild cases occurring in the Rio Grande Valley.

The problem of celery leaf-tyer control, R. E. CAMPBELL (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 133–136*).—Lead arsenate applied at the rate of 3 lbs. to 100 gal. of water or Bordeaux mixture, and not more than 100 gal. of spray to an acre, gave satisfactory control of the celery leaf-tyer (*Phlyctaenia rubigalis* Hubn.), which causes heavy losses in southern California.

A small contribution to knowledge of arsenical requirements for control of codling moth, T. J. HEADLEE (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 206–214, figs. 4*).—On the basis of field studies and experiments, under conditions where codling moth normally infests 100 per cent of all the fruit borne by unsprayed trees, it has been found that "codling moth infestation, under arsenical treatments, varies, within limits, inversely as the amount of lead arsenate per tree per treatment, inversely as the maintenance of coating during the periods of entry by larvae of the first and of the second broods, inversely as the combined factors of lead arsenate and maintenace, and directly as the concentration of infestation."

A bait which attracts the oriental peach moth (Laspeyresia molesta Busck), A. PETERSON (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 181–190, figs. 2*).—The author finds that males and females of the oriental peach moth come to molasses-yeast baits. The adults usually arrive near sunset each day when the temperature is above 55° F. and it is not raining.

Laspeyresia molesta Busck as a quince pest, E. N. CORY (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 199–201*).—The author records the loss of the entire crop in one quince orchard of 1,200 trees in western Maryland due to a combination of cedar rust and the oriental peach moth.

Orchard control work of 1924 against the oriental peach moth in southern New Jersey, L. A. STEARNS (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 191–199, figs. 2*).—The data here presented have been noted from another source (E. S. R., 53, p. 53).

Notes on the life history and behavior of the oriental fruit moth in Pennsylvania during the season of 1924, T. L. GUYTON and A. B. CHAMPLAIN (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 190, 191*).—Observations made during 1924 in the vicinity of Harrisburg showed the average rate of infestation to be about 65 per cent in the ripe peaches.

The oriental fruit moth, T. L. GUYTON and A. B. CHAMPLAIN (*Penn. Dept. Agr. Bul. 405* (*1925*), *pp.* [*2*]+*7*, *figs. 9*).—This is a practical summary of

information on the oriental fruit moth, which at the close of 1924 was known to be present in 16 counties of Pennsylvania.

Life history of pecan nut case-bearer, Acrobasis caryivorella Zell., S. W. Bilsing (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 202–206*).—An account of the life history of this insect, based upon studies at the Texas Experiment Station.

Pyralis farinalis Linn. (Lepidoptera), an alfalfa hay worm in Kansas, N. M. Payne (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 224–227*, *fig. 1*).—The meal moth, usually considered as a stored product or mill pest, has been observed by the author to be an important alfalfa-hay pest near Manhattan, Kans. Both one and two generation cycles were found to occur during the same year in hay. The injury consists in both hay consumed and hay made unfit for use by webbing and excrement. A chalcid parasite is said to be the chief natural enemy.

The new pink borer of sugar cane and corn (Lepidoptera, Noctuidae), E. K. Bynum and T. E. Holloway (*Ann. Ent. Soc. Amer.*, *17* (*1924*), *No. 4*, *pp. 469–472*, *fig. 1*).—A brief account of the large noctuid borer *Meropleon cosmion* Dyar,[4] a native insect which turns from grass to sugar cane and corn. It was first found by the authors at Gulfport, Miss., in May, 1922, while examining sugar cane for the sugar cane borer. The species has been found in Harrison County, Miss., and in the parishes of West Feliciana and Orleans, La.

Status of the European corn borer in the United States in 1924, D. J. Caffrey (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 98–109*).—During 1924 the European corn borer increased the area of its distribution in the United States from 16,052 to 24,773 square miles.

The status of the European corn borer in Ontario (1924), L. S. McLaine and H. G. Crawford (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 95–98*).—The European corn borer has spread rapidly in Ontario, the main corn-growing sections of the province now being infested. Two hundred and twenty-one townships, covering approximately 18,180 square miles, are quarantined or infested.

On certain behavior of the European corn borer (Pyrausta nubilalis Hubn.), L. L. Huber and C. R. Neiswander (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 109–111*).—This is an account of observation at the Ohio Experiment Station of the behavior of more than 270 European corn borer larvae when subjected to certain artificial conditions.

Two cotton bollworms in French West Africa [trans. title], P. Vayssière and J. Mimeur (*Agron. Colon.*, *12* (*1925*), *No. 85*, *pp. 6–14*, *pl. 1*).—This paper deals with *Earias insulana* Boisd. and *E. biplaga* Wlk., the former of which is the most widespread.

The Hessian fly problem in Kansas, J. W. McColloch (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 65–69*).—The author here discusses the Hessian fly problem in relation to the wheat industry in Kansas, emphasis being placed on the fact that it is only one factor in the production of wheat.

The relation of Hessian fly damage to yield, C. C. Hill and H. D. Smith (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 69–73*).—The various ways in which the Hessian fly damages wheat plants and reduces yield are discussed. A series of experiments, reported in tabular form, shows the loss of weight per head for each additional fly larva in the culm, and a comparison is made between the weight of yield of fly-free wheat and that of fly-infested wheat, in which all factors affecting yield other than the Hessian fly are eliminated.

Notes on the life history of the lesser bulb fly, Eumerus strigatus Fallen, B. M. Broadbent (*Jour. Econ. Ent.*, *18* (*1925*), *No. 1*, *pp. 141–143*).—This paper

[4] [illegible]

presents biological notes on *E. strigatus*, which probably best deserves recognition as a potential enemy of narcissus bulbs and onions.

The cattleya fly (Isosoma), Eurytoma orchidearum Westwood, C. F. Doucette (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 143–147*).—This is a preliminary account of studies of the life history and control of *E. orchidearum*, officially known as the orchid chalcid, which has become the most serious pest of the Cattleya group of orchids cultivated in the greenhouses of the United States.

Fruit fly investigations, H. Jarvis (*Queensland Agr. Jour., 22 (1924), No. 6, pp. 435, 436*).—This includes a brief account of *Chaetodacus tryoni*.

A new method for controlling the onion maggot, W. P. Flint and C. C. Compton (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 111–116; also in Market Growers Jour., 36 (1925), No. 8, pp. 16, 17*).—It is pointed out that the average loss from the onion maggot in the area adjacent to Chicago, laying mainly in Cook County, where over 80 per cent of the onion sets used in the United States are grown, amounts to between 10 and 15 per cent of all sets, and that in years when the insects are particularly abundant the damage will reach to from 35 to 50 per cent of the crop.

During the past three years two methods of control have been found effective, the first consisting in moistening the onions with corrosive sublimate solution and the second in the use of Bordeaux oil emulsion. During 1924, when maggots caused a loss of at least 50 per cent of the onion crop, practically complete control was obtained through the use of Bordeaux oil emulsion made by adding boiled lubricating oil emulsion 2 per cent to 4–4–50 Bordeaux mixture.

"Tests in which sprayed and unsprayed onions were exposed to adults of the onion maggot showed Bordeaux oil emulsion had no marked repellent effect in reducing oviposition of the flies on the sprayed onions. Treatments of the eggs and larvae of different sizes with the mixtures which have given the best results in our field tests showed a high percentage of kill from both oil emulsion and corrosive sublimate solution when sprayed upon the eggs and young larvae, but neither of these materials were very toxic to the nearly full grown larvae."

The applications, three to five in number, depending somewhat on the abundance of the maggot, were made directly to the young onions in the row, the first usually when the onions were about 1 in. high, with subsequent applications at 7- to 10-day intervals. The liquid applications were made in a fine stream through a small hose directly upon the onions and in sufficient amount to wet the ground for about 1 in. on each side of the onion plants, or sprayed over the plants in the case of the Bordeaux oil emulsions.

"Examinations of onions at harvest time to show the approximate infestation by second and third brood maggots in the treated and untreated plats showed that the effects of the early treatments were still very apparent, the corrosive sublimate plat having 21 per cent of the onions infested, the Bordeaux oil emulsion 8 per cent, and the check 49 per cent. As to the practicability of treatment, cost figures show an expense of material and labor for treating with corrosive sublimate of approximately $17.50 per acre for each application where 600 gal. of the solution of 1 oz. of bichloride of mercury to 10 gal. of water was used, [and] $6.85 per acre per application for a 2 per cent Bordeaux oil emulsion where 115 gal. of the material per acre was used."

Climate in relation to Mexican bean beetle distribution, J. E. Graf (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 116–121, figs. 3*).—The author points out that the persistence of this pest under varying conditions of temperature and humidity shows that these factors are not important in limiting its distribution

The Mexican bean beetle: A new pest in South Carolina, F. H. LATHROP (*Clemson Agr. Col. S. C., Ext. Circ. 62 (1925), pp. 4*).—This is a brief account of control measures for the Mexican bean beetle, which first entered South Carolina in Oconee County in 1921 and has now spread throughout most of the Piedmont section.

The economic wireworms of the Pacific Northwest (Elateridae), M. C. LANE (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 90–95*).—This account treats of the damage caused by the three species of wireworms of principal economic importance in Washington, Oregon, and Idaho, namely, the inflated wireworm (*Ludius inflatus* Say), the dry-land wireworm (*L. noxius* Hys.), and the wetland wireworm (*Pheletes occidentalis* Cand.).

Boll weevil control by airplane, G. B. POST (*Ga. Agr. Col. Bul. 301 (1924), pp. 22, figs. 11*).—An introductory statement by A. M. Soule is first presented, followed by a letter from B. R. Coad of the U. S. D. A. Bureau of Entomology. The author then discusses the principles, advantages, and organization of airplane dusting at some length.

Notes on the rush weevil, Limnobaris rectirostris Lec., in New Jersey, H. B. WEISS and E. WEST (*Jour. N. Y. Ent. Soc., 32 (1924), No. 4, pp. 196, 197*).—Biological notes are presented upon this weevil, the larva of which feeds in the pith. The parasite *Habrocytus languriae* Ashm. was reared from pupae collected in the larval burrows.

Observations on the morphology and life cycle of Filaria recondita Grassi, M. A. NARAYAN RAO (*Agr. Research Inst., Pusa, Bul. 144 (1923), pp. 7, pls. 2, fig. 1*).—An account of this blood parasite, which was taken from 7 of 299 dogs in a hospital at Madras, and which the author believes to be transmitted through the agency of Culex mosquitoes.

FOODS—HUMAN NUTRITION

Food in the house refrigerator, J. BROADHURST and M. B. VAN ARSDALE (*Nation's Health, 6 (1924), No. 9, pp. 595–597, 641–644, fig. 1*).—The first point considered in this investigation of conditions prevailing in the ordinary house refrigerator was the range of temperature and humidity. Three types of refrigerators were studied, two of which were ordinary zinc-lined refrigerators cooled with ice and one a brine-cooled refrigerator. There were marked differences in construction in the three refrigerators and corresponding differences in the circulation of the contained air. In A, the brine-cooled refrigerator, the temperature ranged from 26 to 62° F. This wide range was attributed to carelessness at the central plant. Of the ice-cooled refrigerators, B gave a narrower but higher temperature range than A, from 46 to 65°, and C, which was the best constructed as regards air circulation, a range when well filled with ice of from 36 to 50 or 52°. The relative humidity was apparently greater in B than in A or C, but it was possible to secure satisfactory humidity readings only with C. In this refrigerator the various shelves tended to be constant in relative humidity, as well as temperature. The average humidity for the various shelves were 29.9 per cent for the warmest top shelf, 44.1 per cent for the middle shelf, and 66.5 per cent for the coldest bottom shelf. Since high humidity favors bacterial growth and the highest humidities were found at the lowest temperatures, the harmful effect of high humidity would tend to be neutralized by the unfavorable temperature conditions.

To show the effect of temperature upon the keeping quality of food in refrigerators, a series of experiments was conducted in which cultures of various organisms and foods whose initial bacterial count was known were exposed at

the various temperatures of different parts of the refrigerator and the rate of increase of the organisms determined by direct count and plating after intervals of from 24 to 48, 72 to 86, and 120 to 144 hours. The tabulated results showed a marked increase in bacterial count with increasing time of exposure, particularly at the higher temperatures. With several of the foods, comparisons were also made of taste and odor, together with laboratory tests for acidity. In general, after about 5 days the changes in taste and odor corresponded fairly well with increases in the bacterial count, but no definite relation was noted between the acidity and bacterial multiplication.

The paper closes with the following recommendations for housewives: "House refrigerators should be constructed to insure constant and complete air circulation. No dead spaces or air pockets should be allowed. The ice chamber should be large and kept well stocked; the larger the ice surface the more contact there is with the circulating air, and the greater the effect upon the air. Thermometers should be supplied for the warmest and coldest shelves at least. Milk should be kept at temperatures below 45°. Temperatures of 60° or more mean that the ice box is acting as an incubator rather than a refrigerator. Since cold air is relatively heavier than warm air, careless management of the doors may allow much of the cooled air to fall out of the box. Watch the thermometer to verify this.

"Milk and similar foods should be kept as cool as possible, and used as fresh as possible. The warmer the shelf and the longer the stay in the refrigerator the greater the bacterial content and deterioration of the food. Such bacterial changes are not without danger to the consumers, especially to babies using stale milk."

Nutrition laboratory, F. G. Benedict (*Carnegie Inst. Wash. Yearbook 23 (1924), pp. 115–123*).—The annual report contains, as in previous years (E. S. R., 52, p. 62), a brief outline of investigations in progress and a list, with brief abstracts, of the publications of the laboratory during the past year.

Continuation and extension of work on vegetable proteins, T. B. Osborne and L. B. Mendel (*Carnegie Inst. Wash. Yearbook 23 (1924), pp. 286–290*).—This progress report (E. S. R., 52, p. 63) includes brief summaries of the investigations on the proteins of spinach and alfalfa leaves reported by Chibnall and Nolan (E. S. R., 52, p. 802), and of recent vitamin and other nutrition studies of the authors and their associates (E. S. R., 51, pp. 71, 268, 371, 557; 53, p. 63).

A rotary nomogram for use in the calculation of diabetic and other diets, W. A. M. Smart (*Brit. Jour. Expt. Path., 6 (1925), No. 1, pp. 14–16, fig. 1*).—A description with diagram is given of a rotary nomogram which can be used to calculate the calorie value of diets furnishing known amounts of protein, fat, and carbohydrate, or, conversely, combinations of protein, carbohydrate, and fat corresponding to any required number of calories.

The comparative physiological importance of iron and zinc [trans. title], G. Bertrand and H. Nakamura (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 3, pp. 129–133*).—The authors report that mice on a diet supposedly adequate except for iron live considerably longer than on a diet free from zinc (E. S. R., 48, p. 63), and conclude that zinc is of even greater physiological importance than iron.

The effect of irradiation and diet on calcium and phosphorus metabolism, J. M. Henderson (*Biochem. Jour., 19 (1925), No. 1, pp. 52–62, figs. 2*).—In this investigation of the retention of calcium and phosphorus under varying conditions of diet and exposure to light, growing pigs were used as the subjects of the metabolism experiments. Two series of experiments were con-

The first consisted of a comparison of the calcium and phosphorus metabolism of 2 young pigs kept in the dark on a ration low in fat-soluble vitamin and poorly balanced with respect to inorganic constituents ($CaO:P_2O_5$=10:25 and $CaO:MgO$=20:19). One of the pigs was irradiated for 1 hour daily with a carbon arc lamp. The animals were kept in metabolism cages throughout the experiment, which consisted of a preliminary period of 10 days in which the food was adjusted to the appetite, a preperiod of 10 days during which analyses of the excreta were carried out, and an experimental period of 24 days during which the analyses were continued and 1 of the pigs was irradiated. At the end of this period the pigs were killed and analyses made of the blood and bones.

The curves for CaO and P_2O_5 balances in the irradiated pig showed before irradiation fairly steady balances, with a tendency toward a decrease in the CaO. Shortly after irradiation both balances decreased, the CaO becoming negative on the fourth day of irradiation. After this there was a steady rise in both, but to a greater extent in the CaO. The average retention of CaO per day was 0.46 gm. during the preperiod and 1.45 gm. during the irradiation period. Corresponding figures for P_2O_5 were 1.88 and 2.07 gm., respectively. The amount of P_2O_5 excreted in the feces decreased and in the urine increased during the irradiation until the values were about equal. The proportion of total CaO excreted in the urine was 2.51 per cent in the preperiod and 6.94 per cent in the experimental period. Corresponding figures for P_2O_5 were 18.21 and 32.59 per cent.

On account of severe gastrointestinal disturbances in the nonirradiated pig, it was impossible to obtain as accurate metabolism results, but with the progress of the experiment the retention of both CaO and P_2O_5 decreased. Irradiation applied during the last 10 days failed to cause any improvement. Both animals weighed 21 kg. at the beginning of the experiment, and at the end the nonirradiated weighed 22.2 and the irradiated 22.4 kg. This would indicate that the factor stimulating retention of calcium and phosphorus does not necessarily stimulate growth.

In the second experiment, 2 young pigs on a well-balanced ration were kept in darkened metabolism cages and 1 irradiated daily as before. A third on the same diet was kept in ordinary diffuse light. In these animals there was little difference in the calcium and phosphorus retention, although there was a slight advantage in favor of the irradiated pig. The urinary calcium and phosphorus showed no tendency to increase following irradiation.

In both series of experiments the analyses of the bones were in general agreement with the metabolic findings. In the first the bones of the irradiated pig contained 4.6 per cent more CaO and 3.2 per cent more P_2O_5 than those of the nonirradiated pig. Corresponding figures in the second experiment were 1.15 and 1.14 per cent. The results for blood calcium and phosphorus were conflicting. In the first experiment the control had a higher blood content of both than the irradiated, and the opposite was true in the second experiment.

The author concludes that the proper balance of inorganic constituents in the diet is of the most fundamental importance, and that under such conditions the influence of light is at a minimum.

The metabolism in pregnancy, I, II (*Amer. Jour. Physiol., 71 (1925), No. 3, pp. 660–678, figs. 5*).—Two papers are presented.

I. *Changes in the tension of alveolar carbon dioxide*, A. W. Rowe, H. L. Banks, and M. D. Alcott (pp. 660–666).—The subjects for this and the following study comprised two groups of pregnant women, the first living in their own homes without dietary or other special control and the second in a nursing

home under uniform standard conditions. The data obtained in this study showed a mild degree of acidosis throughout pregnancy but normal values for acid and phosphate elimination.

II. *Changes in the basal metabolic rate*, A. W. Rowe, M. D. Alcott, and E. Mortimer (pp. 667–678).—The summarized data obtained in the basal metabolism determinations on 26 subjects in the first and 21 in the second group showed an average increase in basal metabolism of 0.9 and 1.02 per cent per week, respectively. From determinations of the weight increase, 0.37 and 0.42 per cent increase in the metabolism can be attributed to the weight increase, leaving as the actual increase in basal metabolism during pregnancy 0.53 and 0.6 per cent per week, respectively.

Energy metabolism of normal new-born babies, with special reference to the influence of food and of crying, J. R. Murlin, R. E. Conklin, and M. E. Marsh (*Amer. Jour. Diseases Children, 29 (1925), No. 1, pp. 1–28, fig. 1*).—In this study of the respiratory metabolism of 50 infants ranging in age from 6 hours to 15 days, 234 observations were made, using the senior author's respiration incubator (E. S. R., 32, p. 860) with slight improvements.

Of the entire number of observations 98 periods with 38 infants were considered to be truly basal. The average figures obtained in these periods were 6.67 calories per hour or 2 calories per kilogram and 29.16 calories per square meter (Lissauer) per hour. The respiratory quotients for these basal periods ranged from 0.66 to 1.16. Averaged by age from all the observations, the respiratory quotient for the first 24 hours was 0.79, the fourth day 0.75, and the ninth day 0.85. The basal metabolism was the highest in the second 24 hours, decreased gradually to the sixth day, and then rose steadily. On the basis of statistical analysis it was concluded that surface area is a slightly better measure of basal metabolism in infants than body weight, and that there is practically no correlation between heat production and pulse rate.

A comparison of basal metabolism with metabolism during crying indicated that the muscular effort of crying involved an increase in metabolism equal to the basal metabolism. Crying 1 per cent of the time raised the metabolism by 1 per cent.

In a study of the influence of food on the energy metabolism it proved impossible to obtain true basal determinations for the same child before and after feeding on the same day. Single supplementary feedings on the second and third days (when the metabolism was the lowest) were without appreciable effect on the respiratory quotient. "This does not signify that the infant is unable to oxidize the sugars on these days, but only that it requires substantial amounts of food to keep the tissues at that point of saturation with glycogen where any addition supplies a surplus which may enter into combustion at once. Nor does the failure to produce a rise in quotient signify that a supplementary feeding of sugar serves no purposes. There are many synthetic chemical reactions concerned in growth where sugar enters into the formation of new tissue."

The largest recorded dynamic action of supplementary feeding was 12 per cent, following a feeding of 10 per cent of lactose. Comparing the effect of small feedings with that of large feedings, a slight increase in the basal heat production was noted with the larger feeding.

Newer viewpoints in infant feeding, E. A. Park (*Conn. State Med. Soc. Proc., 132 (1924), pp. 190–204*).—This is a general discussion of recent advances in the field of infant feeding, including "the recognition that stools are not the immediate determining guide to the feeding of the infant; that many infants thrive only when they receive concentrated milk mixtures; that many infants require not less than 150 to 200 calories per kilogram of body weight;

and, finally, that milk fermented with the lactic acid-producing group of bacilli is more easily digested by many infants than is sweet milk."

Acidification of milk with vinegar (acetic acid) in infant feeding, B. S. Dunham (*Amer. Jour. Diseases Children, 29 (1925), No. 2, pp. 200–205, fig. 1*).—The literature on the acidification of milk to improve its digestibility for children is reviewed briefly, and arguments are presented for the use of ordinary cider vinegar as the acid. The proportion of vinegar and milk giving the most satisfactory results was 1 oz. of apple cider vinegar to 15 oz. of cow's milk. The H-ion concentration of this mixture was about pH 4.2. The milk was given undiluted except to infants younger than two months who received 4 oz. of water or gruel in the total daily feeding. Corn sirup diluted with an equal volume of water was added in the proportion of 1 oz. to a pint of the vinegar milk until after cereal feedings were begun. It is said that the vinegar milk was well tolerated, comparing favorably in clinical results with other types of acidified milk.

Vitamins: What we should eat and why, R. H. A. and V. G. Plimmer (*London: People's League of Health, [1924], pp. 23, pls. 3*).—This pamphlet, which contains an introduction by W. A. Lane, discusses in nontechnical language the function and properties of vitamins and their distribution in common foods, and the planning of the diet to include a sufficient supply of vitamins.

Action of lung fat on growth [*trans. title*], **H. Roger, L. Binet, and M. Vagliano** (*Compt. Rend. Soc. Biol. [Paris], 90 (1924), No. 17, pp. 1310, 1311, fig. 1*).—A single series of experiments is reported in which dog lung fat, when fed to the extent of 3 per cent of the ration to rats on a diet deficient in vitamin A, brought about resumption of growth to an extent equal to that secured with 5 per cent butterfat.

The bactericidal action of the blood in certain dietary deficiencies, G. M. Findlay and I. Maclean (*Biochem. Jour., 19 (1925), No. 1, pp. 63–70*).—A comparison is reported of the bactericidal power of the whole blood of rats on various deficient diets as follows:

In the normal controls the body temperature varied from 37 to 38° C., and the average percentage of staphylococci killed by the blood was 70. In 12 rats on a diet deficient in vitamin A and the antirachitic factor, the corresponding figures obtained when the first symptoms due to a deficiency of vitamin A were noted were 37.2° and 54 per cent. On the same diet followed by a single exposure to ultraviolet light one hour before death, the average figures for 4 rats were 36.6° and 48.5 per cent. In a series of rats killed after varying periods on a diet deficient in vitamin A and the antirachitic factor, a decrease in bactericidal properties occurred after but not before the onset of xerophthalmia. Of 6 rats which had developed rickets on a diet lacking in the antirachitic factor and phosphorus, the bactericidal power was normal in 2 and greatly reduced in 4. In 9 rats killed at varying periods on a vitamin B-deficient diet, the average body temperature at death was 35.3° and percentage of staphylococci killed 43.

It is concluded that rats fed on a diet deficient in vitamin A and the antirachitic factor show a reduction in the bactericidal power of the blood only after the onset of xerophthalmia or some other infection, and that rats fed on a diet lacking vitamin B show a reduction in the bactericidal power of the blood not associated with bacterial infection but possibly correlated with the fall in body temperature.

The effect of digestive juices on the potency of botulinus toxin, J. J. Bronfenbrenner and M. J. Schlesinger (*Jour. Expt. Med., 39 (1924), No. 4, pp. 509–516, fig. 1*).—"Botulinus toxin resists a degree of acidity equivalent to that of the stomach even when exposed thereto for 24 hours at 37° C. It is

less resistant to alkali, however, as shown by the fact that in a medium of weakly alkaline reaction its potency is reduced to less than one-tenth in 24 hours. It is unaffected by peptic and tryptic digestion. Because of its instability in mildly alkaline solutions and resistance to acid, there is reason to believe that the toxin is in the main absorbed from the upper portion of the digestive tract; that is to say, from the stomach and upper duodenum."

The effect of anesthesia and of sedatives on the serum therapy of experimental botulism, J. J. Bronfenbrenner and H. Weiss (*Jour. Expt. Med., 39 (1924), No. 4, pp. 517–532*).—In addition to favorable results previously reported for ether anesthesia (E. S. R., 46, p. 64) and morphine (E. S. R., 48, p. 66) in connection with the serum therapy of experimental botulism in guinea pigs, luminal sodium and nitrous oxide-oxygen were also found to delay the progress of intoxication.

The diabetic problem of today, E. P. Joslin (*Jour. Amer. Med. Assoc., 83 (1924), No. 10, pp. 727–729*).—In this discussion of the present status of diabetes, attention is called to the fact that the disease is 15 times as frequent among those over 40 as among those under 40, from 10 to 20 times as frequent in fat as in thin people, and 2½ times as common among Jews as among the other races. The higher incidence among Jews is shown to be the result not of a racial tendency to the disease but of the tendency to obesity in the adult Jew.

Muscular exercise in diabetes mellitus, K. S. Hetzel (*Brit. Med. Jour., No. 3342 (1925), pp. 102–106, figs. 3*).—Data are reported on the percentage of blood sugar and the presence or absence of glucose and ketones in the urine of three diabetic patients before and after stated periods of exercise taken at different intervals after insulin and food.

"The present experiments show that in a diabetic whose diet contains a moderate proportion of carbohydrate and who receives an adequate supply of insulin, the effect of exercise is beneficial, rapidly lowering the blood glucose to a normal level and diminishing the production and therefore the excretion of ketones and so rendering tissue metabolism more complete. But in a patient even with adequate carbohydrate foodstuff or carbohydrate stores whose diabetes is moderately severe and who is without sufficient insulin, endogenous or exogenous, exercise produces little or no effect on blood glucose and ketosis is increased."

"Optimal" diets for diabetic patients, R. M. Wilder (*Jour. Amer. Med. Assoc., 83 (1924), No. 10, pp. 733–736*).—This is a general discussion of the dietary treatment of diabetes at the Mayo clinic, Rochester, Minn.

The use of a meal unit diet in diabetes, R. H. Major (*Jour. Amer. Med. Assoc., 84 (1925), No. 11, p. 799*).—A simple formula for estimating diets for diabetic patients is outlined as follows:

"The principle of this diet is based on giving the patient 30 calories per kilogram of body weight and giving carbohydrate, protein, and fat in the ratio of 1:2:3. In making the calculation, the patient's weight in kilograms is multiplied by 30. This gives the total calories necessary for basal maintenance diet. One-tenth of this amount of calories is given in carbohydrate, and a division of this figure by 4 gives the grams of carbohydrate necessary. Twice this amount is given in protein and three times this amount in fat."

It is stated that while the system is not applicable to the most severe cases of diabetes, it has been found to work well with the majority of diabetic patients.

Hyperinsulinism and dysinsulinism, S. Harris (*Jour. Amer. Med. Assoc., 83 (1924), No. 10, pp. 729–733*).—The author is of the opinion that there is a

condition, hyperinsulinism, which bears the same relation to hypoinsulinism or diabetes that hyperthyroidism does to hypothyroidism. The symptoms of hyperinsulinism resemble those resulting from an overdosage of insulin and are relieved by taking food more frequently.

The inverse relation of iodin and goiter in Utah, J. C. HATHAWAY (*Soc. Expt. Biol. and Med. Proc., 22 (1924), p. 183*).—Data are summarized on the iodine content of the water supplies of five towns in Utah and the corresponding percentages of goiter among the school children. The iodine content in the water varied from 18 to 216 parts per hundred billion and the corresponding percentages of goiter from 57 to 6 per cent.

ANIMAL PRODUCTION

Formalism in breeding of live stock in relation to genetics, C. WRIEDT (*Jour. Heredity, 16 (1925), No. 1, pp. 19–24, figs. 2*).—This article points out the lack of economic importance of colors and fancy points in the breeds of livestock.

Selecting farm animals by a new method, B. M. GONZALEZ (*Jour. Heredity, 15 (1924), No. 6, pp. 261, 262, fig. 1*).—A method is suggested for selecting breeding animals, based on their size and relative growth in weight.

Mineral nutrient requirements of farm animals, E. B. FORBES ET AL. (*Natl. Research Council, Reprint and Circ. Ser., No. 60 (1924), pp. 12*).—This is the report of the subcommittee on animal nutrition of the National Research Council. The general principles of mineral metabolism are reviewed, followed by a discussion of the more common mineral deficiencies of each of the different types of farm animals. The importance of leguminous roughage is emphasized, and it is pointed out that if there is need for mineral nutrients other than salt, calcium, phosphorus, and iodine are most likely to be deficient in the ordinary livestock ration.

Thyroid influence in cattle, W. A. CRAFT and H. W. ORR (*Jour. Heredity, 15 (1924), No. 6, pp. 255, 256, fig. 1*).—The authors describe a grade Hereford calf brought to the Oklahoma Experiment Station which on slaughter was found to have thryoids and parathyroids only about 20 per cent normal in size, while the pituitary body was 50 per cent normal in size. The calf was described as undersized, having short and irregularly curved legs, abnormally large joints, short and thickened face, and a nervous disposition. The bones of the animal also lacked firmness.

Preliminary report on range cow supplemental feeding, J. L. LANTOW and M. G. SNELL (*New Mexico Sta. Bul. 144 (1924), pp. 8*).—The results of two experiments dealing with the supplemental feeding of range cows during the winter are reported.

Six lots of six cows each were used in the first experiment, which began December 15 and continued 126 days. Lot B, which was used as the unit of measure for the other lots, received 2 lbs. of cottonseed cake per head daily during the first 56 days, 2.8 lbs. for the next 28 days, and 4 lbs. per head daily for the last 42 days. Lots A, C, and D received corresponding amounts of ground corn, ground corn and cottonseed cake equal parts, and whole corn, respectively. Lot E received 1.6 lbs. of cotton seed for each pound of cottonseed cake fed lot B, while lot F received 1.75 lbs. of cotton seed and 1 lb. of ground corn for each 2 lbs. of cottonseed cake fed lot B. All lots except lot B lost in weight during the first 56 days, but gained on the heavier feeding during the last 42 days. The average total gains for the experiment were for lots A, B, C, D, E, and F, respectively, as follows: −6, +8, −1, −39, +19, and +26 lbs. The results showed that the whole corn supplement

was inferior to any of the other rations. Of the cotton seed 1.66 lbs. proved to be more than equal to 1 lb. of corn, 1 lb. of cottonseed cake, or 1 lb. of a mixture of the two. Determinations of the order in which the cows went to pasture following feeding showed that a larger percentage of those of the cotton seed lot went first and a smaller percentage last, but the authors conclude that this was caused largely by the individuality of the cows rather than by the feed.

The second experiment deals with three years' results of supplementing the pasture for beef cows with sufficient cowpea hay and sorghum silage to prevent loss in weight. One lot received no supplement to the pasture. The experiment started with five bred heifers in each lot, and the offspring were added each year. The feeding periods were 87 days the first winter, 135 days the second winter, and 119 days the third winter. The cows produced calves the first year, but those not receiving supplements were very thin. The second year all the fed cows produced calves, while only one receiving no supplement produced a calf. The cows receiving supplements lost an average of 103 lbs., while the others gained 67 lbs. during the second year. The calves from the cows receiving feeds averaged 11 lbs. heavier at birth the first year and 13 lbs. heavier at birth the second year than the calves from cows receiving no supplemental feeding. The cows were sold prior to calving the third year. The calves made greater gains in the fed lot the first year, but contrary results were obtained the second year. The yearlings made greater gains in the unfed lot, but even then were not as heavy as the yearlings in the fed lot.

[Sheep work of the Belle Fourche (S. Dak.) Experiment Farm, 1916–1922], B. Aune (*U. S. Dept. Agr., Dept. Circ. 339 (1925), pp. 33–36, figs. 3*).—The results of sheep-feeding experiments are briefly noted.

Pasturing alfalfa with ewes and lambs.—A 6-year rotation of 3 years of alfalfa and 1 year each of corn, sugar beets, and oats is pastured by ewes and their lambs during the third year of alfalfa, and the corn and beet tops are pastured by lambs, which have also access to alfalfa pasture. The data obtained from 1916 to 1922 are tabulated, and show that the average alfalfa pasturing period for ewes was 69.1 days and for lambs 94.7 days. The lambs made an average daily gain of 0.366 lb. The rate of pasturing has been 8 ewes and 12 lambs per acre.

Pasturing corn and beet tops with lambs.—The lambs have usually been started on the corn, with alfalfa pasture, about September 1, and have had access to beet tops after October 15. The results for the seven years 1916–1922 are tabulated and averaged. There was an average of 35 lambs pastured per acre on corn yielding 50 bu. per acre. The average daily gain made was 0.31 lb. per head. This method of harvesting corn and alfalfa has proved very satisfactory.

Development of the Merino wool fibre, J. E. Duerden and M. I. F. Ritchie (*So. African Jour. Sci., 21 (1924), pp. 480–497, pls. 10*).—This paper reports the results of a histological study of the development of wool fibers.

In conducting the investigation the skin of Merino fetuses at various stages of development was prepared for microscopic examination, and the different stages in the production of fibers are described and illustrated.

Swine feeding investigations, 1922–23, B. M. Anderson and H. W. Marston (*Kansas Sta. Circ. 112 (1925), pp. 8, figs. 4*).—Four lots of 9 pigs in the first lot and 10 each in the other three lots, averaging approximately 72 lbs. in weight, were selected for making studies of the value of adding tankage to a ration of corn with alfalfa pasture, the comparative value of

alfalfa and Sudan grass pastures, and the value of a concrete feeding floor for the summer feeding of pigs on pasture. The feeding period was 120 days.

The value of adding tankage to a full feed of corn fed to spring pigs on alfalfa pasture.—The pigs in lots 1 and 2 were full fed by hand with shelled corn on a concrete floor and allowed to run on good alfalfa pasture. In addition, lot 2 was given 0.25 lb. tankage per head daily. The pigs in lot 1 made average daily gains of 0.74 lb., requiring 445 lbs. of corn per 100 lbs. of gain. The pigs in lot 2 made average daily gains of 1.25 lbs. and required 335 lbs. of corn and 20 lbs. of tankage per 100 lbs. of gain. At the end of the experiment the pigs receiving tankage were ready for market, while it required another 45 days' feeding to finish properly the pigs in the other lot. The alfalfa pasture was virtually destroyed by the rooting of the lot receiving no tankage, but it was uninjured by the pigs receiving tankage.

The relative value of alfalfa and Sudan grass pastures for spring pigs on a full feed of grain.—The pigs of lots 3 and 4 were used for making this comparison, both groups being fed shelled corn and tankage with alfalfa pasture in the former lot and Sudan grass pasture in the latter. The results indicated that the Sudan grass and alfalfa were equally efficient as pastures for fattening pigs, the average daily gain on the alfalfa pasture being 1.23 lbs., and the feed requirements per 100 lbs. of gain being 341 lbs. of corn and 20 lbs. of tankage. The pigs on the Sudan grass pasture made average daily gains of 1.19 lbs. and required 351 lbs. of corn and 21 lbs. of tankage per 100 lbs. of gain. It was also pointed out that the 10 pigs were not sufficient to make the full usage of the 0.5 acre of Sudan grass.

The value of a concrete feeding floor for summer feeding of pigs on pasture.—Lots 2 and 3 were used for making the comparison of the methods of feeding corn on the ground and on a concrete floor. The results showed practically no difference for the two methods of feeding, as gains and feed requirements were very similar.

[Hog-feeding experiments [at the Umatilla Reclamation Project Experiment Farm], H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 342 (1925), pp. 8–13, fig. 1*).—In a hog-feeding experiment conducted during 1921, one lot of 7 pigs, averaging 44 lbs. per head, when placed on 0.218 acre of pasture (alfalfa with some blue grass) and receiving a 2 per cent ration of barley and middlings, required 98 days to reach 100 lbs. in weight. A second lot of 8 similar pigs receiving a 2 per cent ration of corn and middlings (3:1) with 0.2 acre of pasture required 105 days to attain a like weight. A third lot of 5 pigs was brought to 100 lbs. in weight in 63 days on a ration of corn and middlings (3:1) with 0.084 acre of pasture.

In a 33-day finishing test on a 4 per cent ration of cracked corn, middlings, and tankage (10:2:1), the first lot made an average daily gain of 2.02 lbs. per head and required 359 lbs. of grain per 100 lbs. of gain. The second and third lots received the same ration as lot 1, but it was self-fed. The pigs in these lots made average daily gains of 2.58 and 1.81 lbs., respectively, and required 354 and 415 lbs. of grain per 100 lbs. of gain. The estimated total feed cost and feed cost per 100 lbs. gain are calculated and tabulated for the growing and finishing periods.

[Swine work of the Belle Fourche (S. Dak.) Experiment Farm, 1919–1922], B. Aune and S. H. Bober (*U. S. Dept. Agr., Dept. Circ. 339 (1925), pp. 31–33, 39–48*).—The results of hog-feeding experiments are briefly reported, as follows:

Pasturing alfalfa with hogs (pp. 31, 32).—In connection with the irrigated rotation experiments previously noted (E. S. R., 42, p. 370), the third-year

crop of alfalfa in two rotations is pastured by hogs receiving a 2 per cent corn ration. Each plat of alfalfa is divided so that pasturing can be alternated every two weeks. Fall pigs are pastured from early May to July and spring pigs from July to September. The length of the pasturing period, average live weight, grain consumed, and gains per acre are tabulated for each year from 1913 to 1922.

On the two rations the average pasturing periods were 116.9 and 119.25 days, respectively. The average live weights pastured per acre were 2,009.8 and 2,068.9 lbs. The gains made per acre were 1,813.4 and 1,956 lbs., and the grain required per pound of gain was 2.72 and 2.49 lbs., respectively, on the two rotations.

Hogging corn (pp. 32, 33).—Five pigs averaging 74 lbs. in weight were allowed to hog down a 0.25-acre plat of corn in one rotation, and 9 pigs averaging 73.6 lbs. were turned on a 0.5-acre plat of corn in another rotation. The estimated yields of the corn were 68.1 and 68.9 bu. per acre. The pigs in both lots had access to alfalfa pasture. The corn was cleaned up in both cases in 37 days. The former lot gained at the rate of 962 lbs. and the latter 1,035 lbs. per acre. The results obtained in this experiment over periods of 11 and 8 years, respectively, are tabulated and averaged.

Alfalfa pasture for spring pigs supplemented by various grain rations (pp. 40, 41).—Five plats consisting of 0.375 acre each of alfalfa were used in this experiment. The number of pigs and the supplements furnished during the experimental period of 118 days were as follows: Lot 1, 6 pigs receiving a 2 per cent grain ration; lot 2, 9 pigs receiving a 2 per cent grain ration from May 23 to August 13 and corn self-fed from August 13 to September 18; lot 3, 12 pigs receiving shorts self-fed; lot 4, 12 pigs receiving barley self-fed; and lot 5, 12 pigs receiving corn self-fed. The average gains per pig and the feed consumption per 100 lbs. of gain were, respectively, as follows: Lot 1, 56 and 241 lbs.; lot 2, 71 and 290 lbs.; lot 3, 118 and 387 lbs.; lot 4, 135 and 374 lbs.; and lot 5, 110 and 353 lbs. The pigs receiving barley showed a maximum finish and made the most rapid gains, while those in lots 1 and 2 were in good shape to be sold as feeders. It is suggested that, in ordinary years, the production of feeders would be the more profitable procedure for western South Dakota.

Feeding fall pigs from weaning to marketable size (pp. 41–43).—The twenty-four fall Duroc-Jersey pigs, averaging 94 days in age and 39.5 lbs. in weight, were used for determining the feed required in raising a fall pig to marketable size, using 2 per cent shelled corn, supplemented with 3 per cent half-sugar beets and alfalfa hay self-fed during the winter and early spring, followed by alfalfa pasture during the late spring and summer. The pigs made average daily gains of 0.42 lb. during the 145 days of the winter feeding period and made excellent feeders for alfalfa pasture. At the end of the winter feeding period the pigs were divided into two lots, both receiving alfalfa pasture, but in addition one received a 2 per cent ration of shelled corn daily, while the other received 1 per cent of shelled corn for 28 days, 1.5 per cent shelled corn for 42 days, and a 2 per cent shelled-corn ration for 14 days. Both lots made average daily gains of 1.03 lbs. during this 84-day test period. Following the limited feeding, the pigs were self-fed on corn for 14 days, during which time the lot previously receiving the 2 per cent corn ration gained an average of 2.36 lbs. daily, as compared with 2.18 lbs. gained by the other lot. The results showed that less grain was required per 100 lbs. of gain by the lot having its grain more restricted. It required 336 days for the pigs to reach 220 lbs. in weight when alfalfa was utilized in the manner described.

Tankage compared with alfalfa hay as a protein supplement (pp. 43, 44).—In a 184-day feeding experiment, tankage and alfalfa hay were compared as supplements to a ration of corn and half-sugar beets. Two lots of pigs were on test, one of which averaged 50 lbs. in live weight and received 2 lbs. of corn and tankage (10:1) and 3 lbs. of half-sugar beets daily. The other lot averaged 48 lbs. in weight and was fed 2 lbs. of corn and 3 lbs. of half-sugar beets, with free access to alfalfa hay. The former lot made an average daily gain of 0.38 lb., while the average daily gain of the latter lot was 0.51 lb. per head.

Varying grain rations for spring pigs on alfalfa pasture (pp. 44–47).—Rations of 1, 2, and 3 per cent of corn were compared for two pigs on alfalfa pasture. The test lasted 126 days, during which pigs averaging 34 lbs. in weight at the start made average gains per head of 52, 80, and 115 lbs. in the respective lots. The corn required per 100 lbs. of gain was 148, 212, and 277 lbs. At the conclusion of this experiment 5 pigs from each lot were turned into standing corn with access to tankage self-fed. The remaining 5, 4, and 4 pigs from the three lots were full fed shelled corn and tankage in dry lot. All were finished to an average weight of 200 lbs. In the hogging-down experiment this required 52, 44, and 28 days for the pigs from the lots originally receiving 1, 2, and 3 per cent corn rations, respectively. The pigs fed in dry lot required 49, 39, and 27 days to attain a similar weight. The total feed requirement, including an average allowance of 150 lbs. per pig during the suckling period, to grow and finish a pig to 200 lbs. on the 1, 2, and 3 per cent corn rations was calculated at 593 lbs. of corn and 34 lbs of tankage, 618 lbs. of corn and 22 lbs. of tankage, and 669 lbs. of corn and 16 lbs. of tankage, respectively. It is concluded that the most profitable method was the feeding of the 2 per cent corn ration with alfalfa pasture.

Hogging corn (pp. 47, 48).—In comparing the efficiency of hogging down corn alone, corn and soy beans, and corn with alfalfa pasture, pigs averaging approximately 87 lbs. in live weight at the start of the experiment hogged off the corn alone in 28 days, making an average daily gain of 1.39 lbs. and requiring 4.7 lbs. of corn per pound of gain. The pigs receiving corn and soy beans hogged off the corn in 36 days, making an average daily gain of 1.57 lbs. and requiring 4.67 lbs. of corn per pound of gain. The lot receiving corn and alfalfa pasture cleaned up the corn in 38 days, making an average daily gain of 1.66 lbs. and requiring 3.62 lbs. of corn per pound of gain. The pigs were on alfalfa pasture prior to the start of the experiment, and those not receiving alfalfa seemed to desire it.

Maize and barley for pig feeding, H. E. Woodman (*Jour. Min. Agr. [Gt. Brit.], 31 (1925), No. 12, pp. 1089–1103*).—The first part of this paper gives an account of experiments in which the coefficients of digestibility for the nutrients of unsoaked corn, soaked corn, cooked corn meal, and soaked flaked corn were determined with two pigs as follows:

Coefficients of digestibility of corn and corn meal

Feed	Dry matter	Organic matter	Protein	Fat	Carbohydrate	Fiber
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Unsoaked corn	85.9	87.1	78.4	63.5	91.5	28.1
Soaked corn	86.9	87.8	80.1	60.5	92.0	35.3
Cooked corn meal	88.1	89.0	86.1	63.6	92.4	22.6
Soaked flaked corn	95.2	95.4	95.5	44.8	97.1	36.5

The value of cooking is favorably discussed, and a description of the manufacture of flaked corn is given. The process consists of cooking the whole kernels with steam, followed by crushing and drying. A comparison of the nutritive value of this product with raw corn showed that it had a 10 per cent higher energy value.

The second part of the paper gives the results of the comparative value of crushing, grinding, soaking, and cooking corn and barley, as determined in feeding trials.

Eight lots of 10 pigs each were used in the comparison of the different methods of feeding corn. Groups of two lots, each averaging 45 and 28 lbs. per head at the start received corn fed crushed and dry, crushed and soaked, ground and soaked, and ground and cooked, respectively. The average daily gains of the two lots on the respective rations during the six-weeks test were 1.01, 1.03, 1.02, and 0.97 lb. In addition to the full feed of corn, each animal received 1.25 lbs. of middlings and 0.25 lb. of fish meal and a small amount of green feed per day. The feed required per unit of gain was somewhat less for the pigs receiving the cooked feed, but the total food consumption was also less. The author concludes that little is to be gained by cooking.

In comparing the different methods of feeding barley, 5 lots of 10 pigs each averaging 116 lbs. in weight were selected and fed the same basal ration as in the above experiment. The method of feeding the barley and the average daily gains per head were as follows: Whole dry 1.08 lbs., whole soaked 1.06, ground soaked 1.24, and ground cooked 1.19 lbs. The fifth lot received cooked corn and made average daily gains of 1.26 lbs. The food consumption of barley was not greatly influenced by the different methods of feeding, but the nutritive value was decidedly improved by soaking and grinding.

Hog raising for beginners, B. M. Gonzalez (*Philippine Agr., 12 (1924), No. 10, pp. 445–452, fig. 1*).—This deals with the elementary principles of hog production, management, breeding, and feeding, with special reference to conditions in the Philippines.

The horse situation, R. Hudson (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 154–157, fig. 1*).—An account of the past, present, and future condition of the horse situation, with the conclusion that the farmer should at least be prepared to replace his own work animals by breeding.

Studies on Philippine poultry feeds.—I, Availability and palatability, N. A. Tuason and F. M. Fronda (*Philippine Agr., 12 (1924), No. 10, pp. 459–464*).—The authors discuss the availability of various feeds for poultry in the Philippines with the results of two 8 weeks' tests of the palatability of some of the more common feeds conducted at the experiment station. The birds used for the tests consisted of 10 hens, 6 capons, and 2 roosters.

In the comparisons of scratch grains rough rice proved most palatable, followed in order by cracked corn and whole sorghum. The ground feeds tested in separate self-feeders were ranked in the following order of palatability: Dried shrimps, dried fish, mungo, copra meal, cowpeas, rice bran, soy beans, calamismis meal, and blood meal. In tests of mashes which consisted of two-thirds corn meal or rice bran, the corn meal mixtures were more palatable and ranked in the order given when the other third of the mash consisted of mungo meal, copra meal, or calamismis meal. In the rice bran mixtures the calamismis meal proved most palatable, followed closely by copra meal and mungo meal. When blood meal made up one-third of the mash with either corn meal or rice bran the palatability was less than with any of the other feeds.

Poultry feeding experiment, W. C. Rugg and W. O. Pederick (*Jour. Dept. Agr. Victoria, 22 (1924), No. 7, pp. 420–424*).—The results of a comparison of

methods of feeding laying hens are reported from the State Research Farm at Werribee. One lot of 36 White Leghorns received the following grains in separate self-feeders: Bran, wheat middlings, oat middlings, barley middlings, meat meal, rape seed meal, wheat, Algerian oats, cracked corn, barley, and green feed. The mash and scratch feeds for a second lot were mixed, the mash being self-fed and the scratch feed hand-fed in the litter. The third lot received a wet mash in addition to a scratch feed.

The largest egg production was obtained in the pen receiving the wet mash (181 eggs), with the free-choice pen second (174 eggs) and the dry-mash pen last (169 eggs). The free-choice pen ate more feed, but the saving of labor more than compensated for the extra feed cost as compared with wet mash feeding.

Cereal values as determined by number, fertility, and composition of eggs, C. B. Pollard and R. H. Carr (*Amer. Jour. Physiol., 67 (1924), No. 3, pp. 589–594*).—The authors report results from Purdue University of the comparative reproduction of pairs of pigeons receiving one of the following grains as a sole diet: Barley, buckwheat, Canada field peas, corn, hemp, kafir, oats, pop corn, rye, soy beans, sunflower seed, and wheat. All pairs received grit, oyster shells, ground bone, salt, charcoal, and tap water. After six months on one of the grains, the birds were shifted so that each pair received a different grain for three months.

Hatchable eggs were produced only by the birds receiving wheat, rye, corn, and oats, and the squabs from only the wheat and rye rations were raised to maturity. The eggs from the soy bean lot had very weak shells and broke either at the time of laying or soon thereafter. No eggs were obtained from the pairs receiving pop corn, sunflower seed, or buckwheat.

The feeds, feces, and eggs were analyzed for total nitrogen and various nitrogen compounds. The eggs of the birds receiving wheat, rye, oats, and corn had higher melanin nitrogen contents.

On the digestibility of feeds by fowls [trans. title], T. Katayama (*Bul. Imp. Agr. Expt. Sta. Japan, 3 (1924), No. 1, pp. 78, pls. 2*).—The author reports the results of a study of the digestibility of various poultry feeds by the ordinary methods, using two birds, and later determined the digestibility of the feeds with one of the same birds after operating on it so that the feces and urine could be separately collected (anus praeternaturalis). This comparison showed that the total urea nitrogen was very close in amount to 114.6 per cent of the uric acid and urea ammonia. The results further showed that the energy value of the organic substance of the urea was equal to 2.9 calories per gram. The feeds used in the experiments on which the digestibility was determined include wheat, wheat bran, barley, fish meal, various rice products, soy bean meal, and clover hay.

The influence of ultra-violet light on nutrition in poultry, J. M. Murray and C. C. Little (*Maine Sta. Bul. 320 (1924), pp. 141–164, pls. 9, figs. 2*).—In investigations conducted by the authors with the cooperation of W. T. Bovie, of the Harvard Medical School, 9 pens of 25 11-day-old chicks of the 3 breeds Rhode Island Red, Barred Rock, and White Leghorn were selected. All lots were housed in a greenhouse, where they were naturally exposed to glass-filtered sunlight. The regular rations of all lots consisted of chick grain, dry mash, sour milk, rock grit, and water. Three lots were maintained as controls, 2 of which, lots 3 and 7, received no addition to the basal ration, while lot 9 received green feed supplements. The other lots received various supplements and additions as follows: Lot 1 direct sunlight and green feed, lots 2 and 8 15 minutes of ultraviolet light, lot 4 15 minutes of ultraviolet light plus green

feed, lot 5 cod liver oil, and lot 6 15 minutes of ultraviolet light with the air circulated about the chicks during the exposure by means of an electric fan. The results of the experiments are based on the general appearance of the treated and control chicks; the growth rates of the chicks, on which individual determinations were made; mortality; and on X-ray photographs of bone formation.

In general appearance the control and experimental lots showed no differences up to 3 weeks of age, but at 4 weeks the treated birds were more vigorous than the controls, and leg weakness was fully developed in the control pens at the end of 5 weeks. The treated birds increased in weight much more rapidly than the control birds, and X-ray pictures showed that the leg bones were much more mature. The bones of the birds treated with ultraviolet light were more mature than the bones of the birds exposed to sunlight. Chicks receiving cod liver oil did not show leg weakness at the conclusion of the experiment (10 weeks), but their growth rate was not nearly so rapid as that of birds treated with sunlight or ultraviolet light. No noticeable differences were observed when the electric fan was used.

Chemical studies of the oviduct of the hen, G. D. BUCKNER, J. H. MARTIN, and A. M. PETER (*Amer. Jour. Physiol., 71 (1925), No. 2, pp. 349–354*).—The authors report from the Kentucky Experiment Station the lengths and dried weights of the albumin-secreting part of the oviduct, the isthmus, and the uterus of 3 birds killed during heavy laying, 2 near the end of laying, 3 in the resting period, and 1 that had never laid at one year of age. Analyses for calcium oxide and phosphorus pentoxide were made of the dried portions of each oviduct and the materials washed from the inside of each portion.

The lengths and weights of the portions of the oviduct were much greater in the actively laying hens. This was especially true of the albumin-secreting portion and the isthmus. The portions of the oviduct and the washings from the inside showed the presence of only very small amounts of calcium oxide, but the amount was significantly greater in actively laying birds. In contrast to the calcium oxide content, the phosphorus pentoxide content increased as the resting period approached.

The authors conclude that the shell formation of the egg must result from the calcium of the blood, because of the small amounts present in the oviduct and since no evolution of carbon dioxide followed the application of dilute hydrochloric acid to the interior of the uterus.

Winter egg production, C. M. FERGUSON (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 140–143, fig. 1*).—A description is given of the methods of feeding the birds in the State egg-laying contest, with the records of production during the four winter months, November to February, inclusive. The weekly temperature changes are charted against the production, and it is shown that the lower temperatures were usually followed by a lower egg producion.

What the consumer should know about eggs, H. D. PHILLIPS and A. E. ALBRECHT (*N. Y. State Dept. Farms and Markets, Agr. Bul. 172 (1924), pp. 68, figs. 9*).—A popular account of the production, marketing, and storage of eggs, with special reference to the processes of primary interest to the consumer. Recipes for egg dishes are included, by R. L. Parrish.

Raising muskrats for profit, R. G. HODGSON (*Oshawa, Ont.: Fur Trade Jour. Canada, 1924, pp. 40, figs. 9*).—A description of muskrat farming.

DAIRY FARMING—DAIRYING

Ground sorgo seed as a feed for dairy cows, H. W. CAVE and J. B. FITCH (*Kansas Sta. Circ. 110* (*1925*), *pp. 8*).—The results are given of experiments conducted during 1920, 1921, and 1922, comparing corn chop and ground sorgo when fed to dairy cows as 4 parts of grain mixture which also contained 2 parts wheat bran and 1 part linseed oil meal. Ground alfalfa hay and silage were fed in addition. The cows, consisting of 4, 3, and 5 in the respective experiments, were fed by the double reversal method, the feeding periods being 30 days in duration. The first 10 days of each period were considered as preliminary. The average live weight changes, feed consumption, and milk and fat production are tabulated for each period of each experiment.

The combined results of the three experiments have shown no significant differences between corn chop and ground sorgo in their values for milk production and the maintenance of live weight. Both feeds also proved equally palatable. The consumption of hay and silage was practically the same when the comparative rations were fed, but 3.9 per cent more grain was consumed when the cows received corn chop. The average fat percentage of the milk produced with the ground sorgo ration was 4.05 per cent, as compared with 3.84 per cent on the corn ration, resulting in a greater total fat production on the sorgo ration, though the milk production was slightly less.

Comparison of the electrical and German silo for feed preservation and the value of this succulent feed for dairy cows [trans. title], W. ZIELSTORFF (*Mitt. Deut. Landw. Gesell.*, *39* (*1924*), *No. 36, pp. 637, 638*).—Serradella silages preserved in the ordinary German silo and by the electrical method were compared as to the feeding value of each for milk production. Ten cows were used as the experimental animals during four feeding periods, each of which was 10 days in duration with 7-day transition periods intervening. A basal ration was fed during the first and fourth periods, while in the second and third periods, respectively, the electrically treated and the ordinary silages replaced 3 kg. of palm kernel meal and 0.75 kg. of rape seed cake in the basal ration.

The author concludes that the silages showed very little difference in their feeding values. The average daily milk production per animal in the first, second, third, and fourth periods was, respectively, 13, 12.55, 11.6, and 11.8 kg.

Analyses of the silages at the time of ensiling and feeding are tabulated. While differences in the losses of certain ingredients were evident, the total loss by either method was similar. It is pointed out that the ordinary method of silage production is to be recommended because of the greater expense of the electrical treatment.

The use of hay for milk production, T. B. WOOD (*Milk Indus.*, *5* (*1924*), *No. 5, pp. 33–35, figs. 2*).—The author has calculated the maximum amount of hay of various qualities that may be included in the rations of milking cows.

The influence of the administration of certain oils on the nutritive value of the butter fat of cows on winter rations, J. C. DRUMMOND, H. J. CHANNON, K. H. COWARD, J. GOLDING, J. MACKINTOSH, and S. S. ZILVA (*Jour. Agr. Sci.* [*England*], *14* (*1924*), *No. 4, pp. 531–547, figs. 7*).—In continuing the study of the effects of feeding on the vitamin A content of the butter (E. S. R., 49, p. 780), 3 cows were fed on a basal ration of approximately 60 lbs. of mangels, 15 lbs. of hay, and 9 lbs. of grain consisting of equal parts of corn gluten feed, crushed wheat, and soy bean oil meal. During the first portion of the experiment, from December 12, 1922, to February 26, 1923, the basal ration only was supplied and the hay used consisted of fresh, green, meadow hay. During the second period, from February 27 to March 14, the basal

diet of 2 of the cows was supplemented by arachis oil, beginning with 2 oz. daily and increasing to 8 oz. per head. The third cow received coconut oil in similar amounts. The basal ration was again fed during the third period, from March 15 to April 16, except that the meadow hay was replaced by brown seeds hay. During the fourth period, from April 17 to May 17, cod liver oil in 2- to 8-oz. doses supplemented the ration fed in period 3. Period 5, from May 18 to July 11, was a pasture test except that 1 cow still received cod liver oil. The results of experiments by the authors and others with rats indicated that the basal ration and the arachis and coconut oils were low in vitamin A, but the meadow hay apparently contained a substantial amount.

Records of the daily milk and fat yields were kept, and determinations of the vitamin A content of the butter made from the milk of the individual cows were made. The results showed a definite fall in the fat percentage of the milk during the cod liver oil feeding. Certain abnormalities in the analytical constants for the butter were observed during the experiment, but especially when the oils were fed. The pigmentation of the butter gradually decreased as the experiment was continued until the pasture-feeding period, when it again slowly increased.

In the feeding experiments with rats, the vitamin A potency of the butter showed no decrease until the meadow hay was replaced by the brown seeds hay. After this substitution the vitamin A content decreased rapidly from a requirement of about 0.3 to 1 gm. of butter to produce normal growth in a rat. Three weeks after the administration of cod liver oil the potency of the butter had risen so that 0.2 gm. of butter supplied sufficient vitamin A for normal growth. The vitamin A content of the butter of 1 cow was variable during the first period, which was not explained, but the ability of the other 2 cows to maintain uniformly the vitamin A content of the butter in this period was undoubtedly due to the high value of the fresh, green meadow hay.

The production of volatile fatty acids in the intestinal tract of calves fed whole milk or cereal gruel, L. C. Norris (*New York Cornell Sta. Mem. 90 (1925), pp. 3–32, fig. 1*).—A study of the volatile fatty acids and alcohols in the feces of calves fed on whole milk and cereal gruel is reported.

Three calves were used. Calf A received whole milk from birth to the close of the experiment, while calves B and C were gradually changed, beginning on the thirty-fifth and thirty-third days, respectively, from whole milk to cereal gruel, as previously noted by Maynard and Norris (E. S. R., 50, p. 578). All the calves were given all the dry mash that they would consume. The feces were collected from each calf during four 24-hour periods at 7-day intervals, the first collection being made when the calves were approximately 40 days old. In each case the calves had received a uniform amount of feed for 3 days preceding the collection. The 24-hour production of feces was weighed, its water content determined, and characteristics such as color, odor, mechanical condition, and reaction to litmus noted. The volatile fatty acids were removed by the modification of the method of Duclaux described by Gillespie and Walters (E. S. R., 37, p. 803), and identified by the qualitative tests of Agulhon as modified by Dyer (E. S. R., 37, p. 13). The results of the analyses of the feces of the three calves during the different test periods are summarized in the following table:

Acid and alcohol contents of the feces of three calves

Calf	Test period	Ration	Dry matter consumed per day	Feces produced per day	Water in feces	Total acid excreted in feces daily		Acid obtained by the oxidation of the alcohol of the feces	
						Propionic	Acetic	Propionic	Acetic
			Gm.	*Gm.*	*Per cent*	*Cc.*	*Cc.*	*Cc.*	*Cc.*
A	1	Milk	987	490	78.98	240.39	293.66	----------	571.49
	2	do	937	720	80.37	945.96	709.68	----------	1,435.97
	3	do	1,008	750	81.83	289.50	603.45	57.68	778.95
	4	do	1,058	1,132	83.85	492.08	1,311.76	193.23	1,400.62
B	1	Milk and gruel	[1] 850	2,188	84.56	1,461.56	2,067.44	----------	632.99
	2	do	[1] 873	1,990	84.60	1,711.40	2,130.89	----------	3,229.97
	3	Gruel	[1] 1,002	1,980	81.63	684.49	1,282.05	----------	4,092.07
	4	do	[1] 1,169	2,412	78.63	1,766.03	1,965.30	----------	2,667.67
C	1	Milk and gruel	844	1,120	82.49	909.33	948.32	----------	399.50
	2	do	993	1,890	85.85	1,237.57	1,785.86	----------	2,847.85
	3	Gruel	967	2,750	83.65	3,041.23	2,761.28	191.12	5,718.63
	4	do	864	2,700	84.02	2,697.84	2,023.05	----------	6,332.85

[1] No mash given.

The analyses of the feces from the lot receiving gruel showed a distinctly higher acid content than the feces of the calves receiving whole milk. Litmus tests showed the feces of the milk-fed calves to be uniformly nonacid, while the feces of the gruel-fed calves were acid. These results led to the conclusion that the gruel-fed calves were not able to digest completely the large amounts of carbohydrates in their ration and that the partially digested food residues were acted upon by bacteria, resulting in the production of acids and alcohols. The tests showed that the acidity was largely due to acetic and propionic acids, which were present in approximately equal amounts. Ethyl alcohol was also present in large quantities.

Feeding minerals to dairy cattle, O. E. Reed and C. F. Huffman (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 125–132, figs. 3*).—A popular account of the mineral requirements of dairy cattle, with special reference to calcium and phosphorus. The calcium and phosphorus contents of the common feeds are included, as well as suggested mineral mixtures for dairy cattle.

Dietary factors influencing calcium assimilation.—V, The effect of light upon calcium and phosphorus equilibrium in mature lactating animals, E. B. Hart, H. Steenbock, and C. A. Elvehjem (*Jour. Biol. Chem., 62 (1924), No. 1, pp. 117–131*).—In continuing this series of studies (E. S. R., 50, p. 678), two mature lactating goats were brought into negative calcium balance by feeding them in a basement on a ration of ground whole wheat, wheat gluten, sodium chloride, steamed bone meal, potassium iodide, and wheat straw. A third nonlactating goat was brought to calcium equilibrium only after feeding under similar conditions from October to June and by reducing the CaO intake to 20 gm. per week. After establishing calcium equilibrium, the experimental animals were exposed for 10 or 20 minutes daily to the rays of a quartz mercury vapor lamp at a distance of 2 ft. By this radiation the goats were brought into distinct positive calcium balances, which occurred largely through a decreased fecal elimination of calcium. Analyses of the blood also showed that the inorganic phosphorus content was materially increased by the radiation. Two of the animals freshened during the experiment, and it was found that negative calcium balances occurred very shortly thereafter on the antirachitic vitamin deficient ration. One of the lactating animals could not be maintained at a positive calcium balance by reducing the CaO intake per week from about 33 gm. to about 25 gm., even with the continued radiation.

Mathematical law governing the changes of colostrum in milk [trans. title], W. GRIMMER (*Milchw. Forsch., 2 (1924), No. 1-2, pp. 31-46, figs. 8*).—On the basis of a study of the various constituents of the milk of several cows for varying periods after calving, it was shown that the change from colostrum to milk follows the course of a logarithmic curve. The fat-free dry matter, total nitrogen, and serum proteins were most characteristic, while the colostral fat, milk sugar, and in certain cases the casein showed important deviations. The constants expressing the rate of change differed for individuals.

Virginia's dairy cow testing service, F. A. BUCHANAN and L. P. EMMERICK (*Va. Agr. Col. Ext. Bul. 92 (1924), pp. 52, figs. 10*).—An account of the operation of cow testing associations in Virginia, with reference to the register of production in the State, the organization of associations, and the economic relations of testing.

Certified milk in relation to the bacteriological standard, A. T. R. MATTICK and R. S. WILLIAMS (*Jour. Hyg. [London], 23 (1924), No. 3, pp. 277-279*).—The bacterial contents of 184 samples of certified milk produced on one farm from April 1, 1921, to June 6, 1924, are reported. The samples were tested at approximately 24 hours of age and the temperature recorded in each case.

Of the total samples, 97 per cent had less than 30,000 bacteria per cubic centimeter, while of 137 samples arriving at a temperature not exceeding 60° F., 99 per cent were within the standard for certified milk. *Bacillus coli* determinations were also made, with negative results in 96 per cent of the 184 samples.

The importance of keeping the temperature of certified milk below 60° is pointed out.

Proceedings of the annual meeting of the American Dairy Federation . . . 1924 (*Amer. Dairy Fed. Proc., 1 (1924), pp. 37*).—The report of the first annual meeting of this association following its organization.

VETERINARY MEDICINE

Veterinary materia medica and prescriptions, E. W. LUCAS and H. B. STEVENS (In *The Book of Receipts. London: J. & A. Churchill, 1924, 12. ed., [rev. and enl.], pp. 1-77*).—This is a compilation of prescriptions for the treatment of affections of the domestic animals.

Annual report of proceedings under the Diseases of Animals Acts for the year 1922, S. STOCKMAN (*[Gt. Brit.] Min. Agr. and Fisheries, Ann. Rpt. Proc. Diseases Anim. Acts, 1922, pp. 106, pls. 2*).—Part 1 of this report (E. S. R., 49, p. 178) deals with the position of Great Britain with regard to animal diseases, including foot-and-mouth disease, rabies, hog cholera, sheep scab, anthrax, glanders, parasitic mange of horses, and the epizootic abortion order of 1922. Part 2 deals with the importation and exportation of livestock and the protection of animals during transit.

Annual report of proceedings under the Diseases of Animals Acts for the year 1923, S. STOCKMAN (*[Gt. Brit.] Min. Agr. and Fisheries, Ann. Rpt. Proc. Diseases Anim. Acts, 1923, pp. 110*).—This report is similar to that for the preceding year, above noted.

The arsenical poisoning of livestock, G. I. REEVES (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 83-90*).—This is a discussion of the work of H. C. Gardiner on arsenical poisoning of domestic animals, given as evidence in the Riverside Dairy Case in the United States District Court of Utah. It deals with the tolerance of farm animals for arsenic and describes the symptoms of arsenical poisoning and the lesions produced by it, and is based upon an extended

series of feeding experiments, accompanied by clinical observations and followed by autopsies.

Studies on Malta fever, bacillus of Bang, and micrococcus of Bruce; method of differentiation [trans. title], P. DOMINGO and C. LOPEZ (*Compt. Rend. Soc. Biol.* [*Paris*], *92* (*1925*), *No. 10, p. 809*).—It is stated briefly that cultures of *Micrococcus melitensis* which have lost their agglutinating power by prolonged culture on artificial media recover this property when treated with bile, but do not recover their property of agglutniating nonspecific serum. The bacillus of Bang is, however, not changed by bile. This difference in properties is suggested as a means of differentiating between the two organisms.

Our present knowledge of abortion and bovine tuberculosis, R. L. CONKLIN (*Sci. Agr.*, *5* (*1925*), *No. 8, pp. 239–245*).—A brief review of the present status of knowledge of these diseases of cattle and means for their control.

The discharge of Bacterium abortum in the feces of calves fed milk containing the organism, E. H. BARGER and F. M. HAYES (*Jour. Amer. Vet. Med. Assoc.*, *66* (*1924*), *No. 3, pp. 328–336*).—To determine whether the feces of calves drinking milk containing *B. abortum* may be a source of dissemination of this organism, three sets of experiments were carried out at different times with suckling calves, using two calves in each experiment. The calves were obtained from cows with a negative history of abortion and were all under 72 hours old at the beginning of the experiment. All but one were fed artificially infected milk and the remaining one milk from a cow known to be regularly discharging *B. abortum* through the milk. Examination for the presence of *B. abortum* in the feces was made by guinea pig inoculation of fecal filtrates. After from 3 to 4 weeks the calves were slaughtered and the lymph glands and other tissues tested by similar inoculation into guinea pigs.

In the first group *B. abortum* was consistently found in the feces of both animals. In the second group it was found once in one and twice in the other calf. In the third group it was found three times in the feces of the calf receiving artificially infected milk and twice in the one receiving naturally infected milk. None of the calves showed the presence of agglutinins for *B. abortum* in the blood, but the organism was recovered from the lymph glands of the head region of calves in the second and third groups for 17 and 19 days, respectively, after the discontinuance of the infected milk.

It is concluded that the discharge of *B. abortum* in the feces of calves fed milk containing the organism may be a factor to be considered in any plan of control based upon isolation.

Immunologic significance of vitamins.—V, Resistance of the avitaminic albino rat to diphtheria toxin; production of antitoxin and blood pressure effects, C. H. WERKMAN, F. M. BALDWIN, and V. E. NELSON (*Jour. Infect. Diseases*, *35* (*1924*), *No. 6, pp. 549–556, figs. 5*).—In this continuation of the investigation previously noted (E. S. R., 52, p. 179), a study was made of the effect of diphtheria toxin on rats suffering from deficiency in vitamins A and B, respectively, as determined by their resistance to the injection of the toxin, their ability to react with the formation of antitoxin, and the effect of the toxin on the blood pressure of B-deficient rats and normal controls.

Both the A- and B-deficient rats showed a decrease in resistance to diphtheria toxin as manifested by the lethal dose. Calculated on the basis of units of toxin per 10 gm. of rat necessary to cause death, from 56 to 75 units were required for the normal, approximately 30 for the A-deficient, and about the same number, 28, for the B-deficient rats. The break in resistance was more sudden in the A- than the B-deficient rats. The decreased resistance could not be attributed to increased permeability of the cells to the toxin nor to

decreased production of antitoxin. A marked and sudden drop in blood pressure occurred in the B-deficient and the normal rats following the injection of toxin. Blood pressure determinations are not reported for the A-deficient rats, but a lowering of the blood pressure as a result of a deficiency of vitamins A and B has been noted previously (E. S. R., 51, p. 667).

These observations are considered to indicate that the susceptibility of the vitamin-deficient rats to diphtheria toxin is not due to any rupture of the immunity mechanism but to additive effects of the vitamin deficiency and the toxin.

Experimental studies of glanders.—I, The local reaction to nonspecific agents observed in the course of the malleinization of horses suffering from glanders. II, Studies on the local sensitivity of the tissues of healthy horses under the influence of repeated inoculations of mallein [trans. title], S. Koeppe (*Compt. Rend. Soc. Biol.* [*Paris*], *92* (*1925*), *No. 12, pp. 998–1000*).—Evidence is summarized that the mallein reaction in horses already suffering from glanders aggravates the inflammatory reactions caused by nonspecific as well as specific factors, but that horses suffering from glanders but not malleinized are not sensitive to nonspecific factors. It is also shown that the repeated injection of mallein in the same spot produces a local sensitivity to further injections, and it is suggested that in applying the mallein reaction several times to the same animals, the site of injection should be changed in order to avoid the increase in local sensitivity.

Immunization against hemorrhagic septicemia, J. S. Buckley and W. S. Gochenour (*Jour. Amer. Vet. Med. Assoc.*, *66* (*1924*), *No. 3, pp. 308–311*).—In the opinion of the authors the two most important considerations in the production of active immunity against hemorrhagic septicemia are the time required to produce immunity and the selection of the product with which to vaccinate.

It has been demonstrated that vaccinated animals are more susceptible to the disease for the first day or two than unvaccinated animals, and that resistance to the disease does not begin until from the sixth to the ninth day. Between the ninth and fourteenth days the immunity becomes fully established, and at the end of this time the animals can withstand several hundred fatal doses. Aggressins, prepared as described in a previous paper (E. S. R., 51, p. 582), are considered to be the most potent material for vaccination and to have the advantage over bacterins and vaccines of being nontoxic and not producing local abscesses. On account of the delay in immunization the use of aggressin on infected or exposed herds is not recommended. Healthy, nonexposed animals are regularly immunized by doses of 5 cc. of aggressin for cattle and 2 cc. for shotes and sheep.

It is noted in conclusion that a 6-months-old heifer has been successfully immunized against hemorrhagic septicemia by one injection of 3 cc. of a 24-hour bouillon culture of *Pasteurella avisepticu*. This is thought to offer some encouragement as to the possibility of combating fowl cholera with hemorrhagic septicemia aggressin prepared from cattle.

Anaphylaxis and the tuberculin reaction, A. B. Crawford (*Jour. Amer. Vet. Med. Assoc.*, *66* (*1924*), *No. 1, pp. 18–23*).—This paper reviews briefly, with references to the literature, the generally accepted ideas of true anaphylaxis and the essential differences between anaphylaxis and the tuberculin reaction.

Studies of biological preparations by complement-fixation methods.—II, Tuberculin: A new method of standardization, E. A. Watson and L. M. Heath (*Jour. Amer. Vet. Med. Assoc.*, *66* (*1924*), *No. 1, pp. 24–35*).—The authors

have applied the methods developed for the standardization of mallein in the presence of a specific antimallein serum (E. S. R., 47, p. 881) to the standardization of tuberculin, and have developed a method which is not only comparable with the guinea pig test method as an indicator of the potency of the product, but actually determines the number of active units in a given quantity of tuberculin.

The antiserum for the test was prepared by a series of intravenous injections in the horse or ox of virulent cultures of tubercle bacilli, blood samples being taken at approximately weekly intervals for complement fixation tests until a sufficiently high titer was reached. Equally satisfactory results were obtained in another horse by a similar method of inoculation, preceded by a series of injections of bouillon filtrate and two suspensions of bacilli heated at 65° C. The serum of the first horse titered at 150 units per cubic centimeter when fresh and at 100 units per cubic centimeter after storage in the refrigerator for one year and that of the second horse at 100 units per cubic centimeter and 80 units 10 months later.

In titrating against tuberculin, the minimum amount of tuberculin added to 20 units of antiserum that is capable of completely fixing the unit of complement was taken as representing 1 active unit of tuberculin. Using this standard, the antigenic value of a series of standard and commercial tuberculins was determined and checked by potency tests on guinea pigs. The satisfactory agreement in these tests was substantiated in a second series of experiments with 12 samples of liquid tuberculins furnished by E. C. Schroeder, of the Bureau of Animal Industry, U. S. D. A., who also conducted the guinea pig tests.

Does tuberculin spread Tb? L. L. RUMMELL (*Ohio Farmer, 155 (1925), No. 16, pp. 8, 9*).—Communications from a number of American authorities on bovine tuberculosis are presented, from which the conclusion is drawn that tuberculin as ordinarily used in testing cattle, and especially in the tail and eye tests, does not have any appreciable effect on tubercular lesions whether calcified or not. The lesions may become active at any time without the administration of tuberculin.

No-lesion and skin-lesion tuberculin-reacting cattle, E. G. HASTINGS, B. A. BEACH, and C. W. WEBER (*Jour. Amer. Vet. Med. Assoc., 66 (1924), No. 1, pp. 36–42*).—Attention is called to the increasing importance of no-lesion and skin-lesion cases in the tuberculin test under present conditions when the test is being more widely used in regions in which the healthy herds outnumber the infected.

In a recent test of 30,010 cattle, 337 reactors were found, with a percentage of no-lesion animals of 22.55. In another test of 21,669 cattle, 183 reactors were found, with a percentage of no-lesion animals of 25.13. In a single herd of Holsteins approximately one-sixth of the herd was killed in one year on account of reacting to the tuberculin test and no lesions were found in any case. The examination of a large number of skin lesions gave no evidence of their being tuberculous. The authors' views concerning this evidence are as follows:

"The evidence above presented seems to us to point to the invasion of the tissues with an organism or organisms which can sensitize to tuberculin, which do not grow on the usual culture media employed for acid-fast bacilli, and which do not infect experiment animals. The presence of acid-fast bacilli in some of the skin lesions may indicate, as would be expected, that members of this group are the causal agents in the sensitization to tuberculin in a part of the no-lesion and skin-lesion cases."

The whys of tuberculin test failures, G. E. Corwin (*Jour. Amer. Vet. Med. Assoc., 66 (1924), No. 1, pp. 54–57*).—A general discussion.

Report of experimental work to determine whether avian tuberculosis is transmitted through the eggs of tuberculous fowls, C. P. Fitch, R. E. Lubbehusen, and R. N. Dikmans (*Jour. Amer. Vet. Med. Assoc., 66 (1924), No. 1, pp. 43–53*).—Previous work on the possibility of the transmission of avian tuberculosis through the eggs of tuberculous fowls is reviewed, and additional data are presented as follows:

Of 62 hens reacting to the tuberculin test, only 43 produced eggs. A total of 876 eggs from these hens was examined for the presence of the organism, 367 by culture and 509 by inoculation into hens. The culture experiments proved unsatisfactory. In the inoculation experiments eggs from only 3 hens were found to contain tubercle bacilli and in these the organism was present in small numbers only. As judged by these results, it is estimated that less than 1 per cent of eggs from tuberculous fowls actually contain living tubercle bacilli.

The sediment obtained from saline suspensions of the washings from the shells of 209 eggs coming from known tuberculous fowls was injected into poultry with negative results in all cases. This method of dissemination is also considered insignificant.

An inquiry into the cause of the increase of tuberculosis of swine, L. Van Es and H. M. Martin (*Nebraska Sta. Research Bul. 30 (1925), pp. 3–78, pls. 16, figs. 3*).—In the investigations here reported, material obtained by the authors from 250 Nebraska shipments originating in 41 counties was used, representing a total of more than 14,299 swine, of which not less than 2,781, or 19.5 per cent, were retained on account of tuberculosis. Of the 250 lymphnode consignments, 2 were discarded, 31 gave negative results, and 8 yielded results which made avian origin of the infection highly probable, the number of consignments yielding results permitting a definite interpretation being 209, of which 11 were of mammalian, 185 of avian, and 13 of mixed origin.

The authors have been led to conclude that the type of swine tuberculosis responsible for the increased retentions of carcasses and the condemnation of parts is for the greater part due to infection of avian origin. "In the eradication and control of swine tuberculosis, success can only, then, be attained when the two chief fountainheads of infection, namely, the tuberculous cattle herd and the tuberculous poultry flock, be regarded as equally important. There are indications that the steady increase in the incidence of swine tuberculosis as shown by abattoir statistics reflects a similar increase in the spread of avian tuberculosis in a large area of the United States. In the intradermal tuberculin test of swine in which a mammalian tuberculin is used, a considerable number of cases of tuberculosis will escape detection. For dependable results, avian tuberculin must also be used. In the bacteriologic diagnosis of tuberculosis of swine by animal inoculation tests, the results will, for a large proportion of the cases, remain inconclusive when only cavias are used for the purpose. In the case of swine, at least, some laboratory animals susceptible to avian tuberculosis also or susceptible to both avian and mammalian tuberculosis should be included in the experiment."

A bibliography of 55 titles is included.

Tuberculosis of swine, L. Van Es (*Nebraska Sta. Circ. 25 (1925), pp. 3–27, pls. 8*).—This is a popular summary of information on this disease of swine, based in part upon the investigations above noted.

A modification of the chloroform process for clarifying hog cholera serum, R. R. Henley (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 4, pp. 485–

467).—Certain defects which have developed in the application on a large scale of the author's method of clarifying hog cholera serum (E. S. R., 47, p. 85) are outlined, and slight modifications in the method are described.

A study of the physiologic and pathologic changes occurring in the reproductive organs of the cow following parturition, W. L. Boyd (*Minnesota Sta. Tech. Bul. 23 (1925), pp. 3–39, pls. 8*).—This is a report of investigations conducted, with few exceptions, upon purebred cows owned by the University of Minnesota, which made possible frequent and in many cases daily examinations. The details of 19 cases studied are presented.

The author finds that involution consists of numerous and interesting phenomena, the most important of which is the reduction in size of the uterus. "The act of involution offers a barrier to infection, but when sepsis occurs involution is stopped or retarded. The uterus, which regresses rapidly in size and possesses normal muscle tone, does not readily absorb bacteria or their products. In cows in which the act of parturition is normal and the fetal membranes have been promptly expelled, regression of the uterus as a rule is very rapid. The uterus will in many cases resume its nongravid position and morphology within 10 days. However, in a large number of cows which have apparently calved normally in every way and which to all appearances do not develop infection, 2 or 3 weeks are frequently required before the uterus is completely reduced. The entire amount of time required for the completion of the various phenomena of involution varies from 30 to 40 days.

"The relation of the corpus luteum to involution is not known, but in certain cases of uterine affection, particularly pyometra, in which involution is retarded or entirely stopped, the early removal of the corpus luteum is followed by vigorous muscular contraction of the uterus, resulting in evacuation of its contents and restored normal function of the reproductive organs. Retention of the fetal membranes is a serious menace to involution, and not only produces subinvolution but seriously interferes with the immediate health of the cow and endangers her ability again successfully to reproduce.

"*Bacterium abortus* Bang is capable of producing extensive and severe placentitis with infiltration and edema of the chorion. Retardation of involution as a result of sepsis, which may affect not only the uterus but the oviducts and ovaries as well, is usually due to pyogenic bacteria. In these cases suppurative inflammation is not uncommon. Among the organisms frequently found are the *Bacillus pyogenes*, staphylococci, streptococci, *B. coli*, and other pyogenic organisms. Successful control of bovine infectious abortion will mean a greatly reduced percentage of cases of retained fetal membranes, which in turn will reduce the cases of subinvolution and subsequent disorders of the reproductive organs resulting in either temporary or permanent sterility."

Oedema in South African cattle, A. D. Stammers (*Brit. Jour. Expt. Path., 5 (1924), No. 6, pp. 313–317*).—Several cases of edema which recently occurred among animals at the Johannesburg Municipal Abattoir and were found to be due to some form of malnutrition are briefly reported upon.

A test of raw onions in the diet as a control measure for worms in dogs, M. C. Hall, J. E. Shillinger, and E. B. Cram (*Jour. Agr. Research [U. S.], 30 (1925), No. 2, pp. 155–159*).—The authors report that raw onions when fed at the rate of 2 oz. daily to each of 3 dogs for 60 days and to 1 dog for 37 days show too little anthelmintic value to warrant their use as a control measure for worms in dogs. They are evidently of no value in removing hookworms or tapeworms, and, in spite of the passage of numerous whipworms, the nature of some of the worms passed, and the factor of mechanical anthelmintic action in the case of the dog passing 74 per cent of its worms, suggests that the

worms were passed partly as the result of their death from old age and partly from the action of mechanical anthelmintics. A list of 13 references to the literature is included.

A disease of fowls in Palestine characterized by leucocyte inclusions, S. ADLER (*Ann. Trop. Med. and Parasitol., 19 (1925), No. 1, pp. 127–135, figs. 17*).—The author describes a disease of fowls occurring in Palestine which is characterized by various forms of chromatic inclusions in the leucocytes. The inclusions appear to be identical with the leucocytic inclusions previously described and figured by J. W. S. Macfie[8] from Eket, Nigeria, and it is considered to be the chronic form of that disease. It can be transferred to healthy fowls by blood inoculation, the inclusions appearing five or six days after the operation. The inclusions are considered by the author to be true parasites belonging to the Chlamydozoa. Transmission experiments with *Argas persicus* were not successful, but the experiments are not conclusive.

AGRICULTURAL ENGINEERING

General physics, E. S. FERRY (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1923, pp. XVI+812, figs. 601*).—The purpose of this book is to impart information and to give training in the methods by which facts are correlated in laws and these laws applied to the affairs of life. Special attention is given to agriculture, engineering, and general science.

Applied elasticity, J. PRESCOTT (*London and New York: Longmans, Green & Co., 1924, pp. VII+666, figs. 184*).—The purpose of this book is to deal with the subject of applied elasticity from the point of view of the engineer. It contains chapters on analysis of stress; relations between stress and strain; some particular solutions of the equations of equilibrium; the empirical basis of elasticity; the bending of thin rods by transverse forces; thin rods under tension or thrust; torsion of rods, Saint Venant's theory; the energy in a strained body; transverse oscillations of thin rods; longitudinal and torsional oscillations of rods; the equilibrium of thin curved rods; spheres and cylinders; stretching of thin plates; the bending of thin plates under normal pressures; the bending of thin plates, more accurate theory; stability of thin plates; cylinders with thin walls; vibrations of rotating disks; and elastic bodies in contact. Three appendixes are included.

Temperature measurement process for determining the loss of seepage water from canals [trans. title], F. ZUNKER (*Zentbl. Bauverwalt., 42 (1922), Nos. 3, pp. 10–15, figs. 7; 4, pp. 17–19, figs. 2; 6, pp. 29, 30, fig. 1*).—This method and its application to existing canals in Germany is described.

The hydrogen ion concentration of certain Wisconsin lake waters, C. JUDAY, E. B. FRED, and F. C. WILSON (*Amer. Micros. Soc. Trans., 43 (1924), No. 4, pp. 177–190, figs. 2*).—Studies are reported which showed that the changes in the H-ion concentration of the water of Lake Mendota are correlated with the seasons. During the spring and autumn periods of circulation the H-ion concentration is substantially uniform for all depths. During the summer and winter periods of stratification the upper water is much more alkaline than the lower. The photosynthetic activities of the algae cause an increase in the alkalinity of the upper water, while carbon dioxid liberated chiefly by decomposing organic matter causes a decrease in the alkalinity of the lower water. The upper water was found to be more alkaline than the lower in summer in five other lakes.

[8] Ann. Trop. Med. and Parasitol., 8 (1914), No. 3, pp. 439–468.

Duty-of-water experiments [at the Umatilla (Oreg.) Reclamation Project Experiment Farm, 1921], H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 342 (1925), pp. 13–16*).—Data from duty-of-water experiments with alfalfa on soils varying from very coarse to very fine sand are briefly reported. These indicated a relation between the type of soil and the water requirement. The yield per unit of water applied to the land was greatest on the finest soil and ranged in order from the finest to the coarsest soil. Each unit of water applied to the very fine sandy soil gave a return in tons per acre-foot which was 14 times greater than from the same application on very coarse sandy soil, 2.1 times greater than on coarse sandy soil, 2.9 times greater than on medium sand, and 1.6 times greater than on fine sand.

[Irrigation experiments at the Umatilla (Oreg.) Reclamation Project Experiment Farm], H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 342 (1925), pp. 20–22*).—Size, length, and width of border experiments and lysimeter investigations of the moisture relations of sandy soils and the effect of crops on these relations are briefly reported (E. S. R., 44, p. 189).

In the length of border experiments it was found that the quantity of water applied annually and the depth per application required increased directly with the length of the run. The width of border experiments showed that 20- and 25-ft. borders were very economical of water, and that the 30- and 35-ft. borders did not require excessive quantities.

Drainage control on muck land, H. H. Musselman (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 138, 139, figs. 2*).—Data on the control of drainage in muck land by the use of control dams are briefly presented.

Terracing farm land, D. G. Carter (*Ark. Agr. Col. Ext. Circ. 182 (1924), pp. 7, figs. 4*).—Practical information is presented on the terracing of farm land in Arkansas.

Hedge and stump clearing devices, B. J. Owen and H. G. Richardson (*[Gt. Brit.] Min. Agr. and Fisheries, Misc. Pub. 35 (1923), pp. 55, pls. 6, figs. 2*).—This is the second edition of this report, which deals with tests of hedge and stump clearing devices. Assuming that no initial outlay was necessary for tools, it was found that the work done with hand tools was efficient but that the method was laborious and slow, and it was too expensive and too slow to be recommended for clearing a large area.

Tests of 5- and 10-ton timber jacks showed that the actual movement of the jack was relatively small and was liable to be partly absorbed in overcoming the resilience of the tree and of the ground. This device compared unfavorably with others, and it appeared unlikely that it can be used economically for work of this character.

In tests of a vertical pull stump extractor it was shown that this machine compared favorably as regards cost with other devices. It was found, however, that a large amount of earth adhered to the roots, although the roots were pulled out intact, as contrasted with methods which require a sudden extraction, with a tendency to leave broken roots in the ground. This machine appeared to be suitable for use by a farmer having a considerable number of stumps to clear but who is unable to spend a long time uninterruptedly on the work.

Tests of a triple horse stump puller, of 300,000 lbs. estimated maximum extracting power, showed it to be one of the most rapid in operation for the extraction of small stumps. Owing to the necessity of hitching the cable near the ground to permit horses to step over it, it was impossible to take advantage of the extra leverage which would be obtained by hitching the cable higher. It is concluded that this machine was efficient and might be used

economically in dealing with considerable areas of timber where it is undesirable to use explosives, or where heavy manual labor is an objection.

Steam tractors gave results in stump pulling comparing favorably with those from other mechanical devices, although the stumps extracted were relatively small. A great deal of hand grubbing was necessary in the case of larger stumps. Tests of a steam plowing engine on larger stumps indicated the necessity for considerable hand grubbing as did those of an ordinary motor tractor on shallow rooted stumps, which accounts for a high cost per cubic foot of stump removed.

Ordinary farmers' dynamite, while giving a high average cost per stump, gave a low average cost in terms of cubic feet of stump removed. It was also possible to remove large stumps which were beyond the capacity of ordinary mechanical devices. Tests of liquid air indicated the possibility of using this material as a stump blowing explosive, and incidentally of quite materially reducing costs. The method of operation, however, is not so rapid as with other explosives, and the radius of the use of liquid air is restricted to a short distance from the producing plant. Explosives were found to be the most advantageous from the standpoint of handling and treatment of timber after removal.

It is to be noted that all of this work has been based upon the removal of stumps in terms of cubic feet of volume. Methods for computing the volume of stumps of different shapes are outlined.

Road engineering, E. L. Leeming (*London and Bombay: Constable & Co., Ltd., 1924, pp. XIII+279, pls. 2, figs. 125*).—This is one of the Glasgow Text Books of Civil Engineering edited by G. Moncur. The purpose of the book is to give in concise form the technology of road construction as viewed in the light of new conditions created by modern traffic, with special reference to British conditions. It contains chapters on subsoils and drainage; bridges, culverts, and retaining walls; camber and its effects; curves; superelevation on highway curves; the design and improvement of hill roads; census of traffic and its relation to road widths; sett-paved roads; water-bound macadam; bituminous and tarred roads; concrete roads; reinforced concrete; sidewalks; road corrugation; measurement of wear; the influence of tires, speed, and vehicle design upon road surfaces; underground work and reinstatement of paving; labor-saving machinery; and organization and administration. Three appendixes are included, viz, British standard nomenclature of tars, pitches, bitumens, and asphalts when used for road purposes; road-direction posts and warning signs; and road legislation.

Structural engineers' handbook, M. S. Ketchum (*New York and London: McGraw-Hill Book Co., Inc., 1924, 3. ed., enl., pp. XV+1065, figs. 450*).—This is the third edition of this handbook of data for the design and construction of steel bridges and buildings (E. S. R., 42, p. 486). In this edition the book has been revised and partially rewritten and more than 130 pages of new material has been added. The most important additions are chapters on the design of self-supporting steel stacks, constant-dimension steel columns, steel column footings, and specifications for structural steel for buildings.

United States Government master specification for asphalt for mineral-surfaced roofing (*U. S. Dept. Com., Bur. Standards Circ. 159 (1924), pp. 10, figs. 3*).—The text of the specification is given.

United States Government master specification for asphalt primer for roofing and waterproofing (*U. S. Dept. Com., Bur. Standards Circ. 162 (1924), pp. 7, figs. 2*).—The text of the specification is given.

United States Government master specification for coal-tar pitch for waterproofing and damp proofing (*U. S. Dept. Com., Bur. Standards Circ. 155 (1924), pp. 11, figs. 3*).—The text of the specification is given.

Paint law and regulations (*N. Dak. State Food Commr. and Chem. Bul. 8 (1925), pp. 45–68*).—The text of paint and varnish laws and the regulations for the State of North Dakota are presented, together with the results of analyses of 37 samples of paints and varnishes collected for inspection in the State since 1920.

The 1921 test paint fence, W. T. PEARCE and A. N. LOUDON (*N. Dak. State Food Commr. and Chem. Bul. 8 (1925), pp. 1–44, fig. 1*).—Continuing previous work (E. S. R., 47, p. 390), the results obtained with the 1921 test paint fence are presented.

These are said to be in rather good agreement with the data obtained for the 1915 test fence after a similar period of exposure. The chief difference noted between the data for the two fences is that the paints containing rather high percentages of inert pigments such as asbestine and barites are showing much greater durability on the 1921 fence than on the 1915 fence.

New data on radiator finishes and their effect on heat transmission, W. H. SEVERNS (*Heating and Ventilating Mag., 22 (1925), No. 2, pp. 51–53, figs. 2*).—Studies conducted at the University of Illinois are briefly reported, the results of which are taken to indicate that the application of aluminum bronze to the surfaces of radiators ordinarily used in direct steam heating will not cause a reduction of 26 or even 18 per cent in the amount of heat transmitted by the surfaces, as has been found by others. These percentages are said to be too large, and a reduction of 10 per cent in the amount of transmitted heat is considered to be more nearly correct. This means that from 10 to 11 per cent more square feet of direct radiation covered with aluminum bronze are necessary to supply a given heat loss than would be necessary if clean radiators, either fresh from the foundry or dipped in gray paint, were used without aluminum bronze.

Application of electricity to agricultural apparatus [trans. title], MOUSSET (*Bul. Soc. Franç. Élect., 4. ser., 4 (1924), No. 36, pp. 515–531; abs. in Sci. Abs., Sect. B—Elect. Engin., 27 (1924), No. 324, p. 564*).—A general review is made of the field of the application of electricity to farming operations in Europe, with particular reference to the operation of the various mechanical appliances commonly used. In this connection a classified list of apparatus is given with the approximate power requirement in each case. The method of use and the location of the various motors required is discussed, and attention is drawn to the advantage of portable motors. Methods of promoting the agricultural use of electricity are also outlined.

Use of electrical energy in the smaller rural industries [trans. title] (*Nuovi Ann. Agr. [Italy], 4 (1924), No. 3, pp. 489–565*).—This is a somewhat detailed discussion of the economic and engineering features of the application of electricity to Italian farming, special reference being made to the requirements for irrigation pumping and plowing.

Electric plowing [trans. title], GUEDENEY (*Bul. Soc. Franç. Élect., 4. ser., 4 (1924), No. 36, pp. 533–545, figs. 4; abs. in Sci. Abs., Sect. B—Elect. Engin., 27 (1924), No. 324, p. 565*).—The advantages of electric plowing over other methods are outlined, and it is stated that one complete outfit of this type with two men can do the work of from 50 to 60 draft animals and from 10 to 15 men. The outfit described consists of a double drum portable winding engine with 2 ropes and 4 anchor pulleys, 2 of which are fixed and 2 movable. It is stated that an area of approximately 40 acres can be plowed from one position of the winding engine.

Machines for the planting and digging of potatoes, C. SANTINI (*Le Macchine per Piantare e per Scavare le Patate. Portici: Lab. Mecc. e Costruz., R. Scuola Super. Agr., 1924, pp. 79, figs. 39*).—A number of different potato planters and diggers are described and illustrated, and service tests are reported.

Machines for spraying and dusting diseased crops (*Egypt Min. Agr., Bot. Sect., Mycol. Div. Leaflet 3 (1923), pp. 4, pls. 8*).—Machines for spraying and dusting diseased crops are briefly described and illustrated, with particular reference to the requirements of Egyptian argiculture.

Modern pisé-building, K. J. ELLINGTON (*Port Angeles, Wash.: Author, 1924, pp. 116, figs. 68*).—A detailed description of the use of pisé de terre in the construction of buildings is presented which includes working drawings illustrating methods of procedure.

Dairy barns and equipment, W. A. FOSTER and E. WEAVER (*Iowa Sta. Circ. 93 (1925), pp. 31, figs. 22*).—The essential and desirable features of dairy barns are discussed from the standpoint of Iowa conditions, and drawings of different structural details are included, together with analytical discussions thereof.

The construction of cow-houses ([*Gt. Brit.*] *Min. Agr. and Fisheries, Misc. Pub. 40 (1924), pp. 14, pls. 4, figs. 6*).—Practical information and working drawings for the construction of cow houses, with particular reference to British conditions, are presented.

RURAL ECONOMICS AND SOCIOLOGY

Rural problems in the United States, H. REW (*Edinb. Rev., 241 (1925), No. 491, pp. 153–166*).—The author comments upon data which have been noted by Gray et al. (E. S. R., 51, p. 791) and other studies of land utilization in the United States and especially upon the indicated swing of the balance of political power here from the country to the towns. His observations upon recent visits in this country are that great importance is attached to the study of rural sociology and that emphasis is put upon many rural and farm problems in the educational institutions. He notes also that there is considerable familiarity with British agrarian questions.

Inquiry with reference to production.—General report, I (*Enquête sur la Production. Rapport Général, I. [Geneva]: Bur. Internatl. Travail; Paris: Berger-Levrault, 1923, vol. 1, pp. XXXIII+444, figs. 87*).—This is the first of four volumes which are planned to summarize the results of an inquiry into agricultural production by the International Labor Office. A questionnaire was sent out to which a number of Governments replied. This volume, in addition to some introductory statistical chapters dealing in general with the relation between price movements, production, and employment and with working conditions in a number of countries during and since the war, is devoted chiefly to setting forth the method of the inquiry.

[The progress of agricultural development on the Umatilla Reclamation Project in 1920, 1921, and 1922], H. K. DEAN (*U. S. Dept. Agr., Dept. Circ. 342 (1925), pp. 1–4, 6*).—Portions of the report of work on this Oregon project are concerned with the progress of settlers, showing farm values per acre of crops produced, 1914 to 1922, inclusive; the importance of alfalfa with respect to farm values, 1911 to 1922, inclusive; and the number and value of livestock and the value of equipment, together with the acreage, yields, and ro rm values of crops produced in the years reported upon.

pp. 7, op conditions **[and livestock production on the Belle Fourche (S. Reclamation Project, 1919–1922],** B. AUNE (*U. S. Dept. Agr.,*

Dept. Circ. 339 (1925), pp. 4–9, fig. 1).—Tabulated summaries and notes are given showing the acreage, yields, and farm values of the principal crops for the latest year of the report and for the period 1913–1922 and indicating the number and value of livestock on hand for the same dates. The carload lots of livestock shipped from 1916 to 1922, inclusive, are also tabulated.

Economic studies of dairy farming in New York.—III, Grade B milk with alfalfa roughage, E. G. MISNER (*New York Cornell Sta. Bul. 438 (1925), pp. 104, figs. 4*).—This study is one of a series of which two have been noted (E. S. R., 52, p. 589).

Of 125 farm business records taken in Madison County, N. Y., for the crop season of 1921, 108 were included for the crop year 1922. The average size of the 125 farms was 141 acres and of the 108, 145 acres. The capital invested per farm averaged $15,371 in 1921, and somewhat more than that in 1922. The total receipts per farm in 1921 were $4,278 and in 1922, $3,697. The crops produced and the numbers, purchases, sales, and debts of cattle and other livestock are tabulated.

In 1921 the average net farm income was $997 and the labor income $228, while in 1922 the farm income was $783 and the labor income $4. The costs of producing milk are tabulated in detail under the headings of the specific items and charges comprising them. The returns are shown for milk and milk products, calves born during the year, manure, and miscellaneous returns. The net cow cost of producing milk in 1921 was $2.50 per 100 lbs. and in 1922 $2.54. In 1921 the average loss was $19.87 per cow and 32 cts. per 100 lbs. of milk, but after all charges except those for labor were met the returns were 13.9 cts. per hour for all time spent on the enterprise. In 1922 the average loss was $20.65 per cow and 35 cts. per 100 lbs. of milk. The returns were 16.1 cents per hour for the time spent.

Attention is given to the cost of raising heifers, the influence of fall or spring freshening on the returns of the business, variations in the size of the business, and the relation of the number of cows to the cost of milk production and the labor income. The labor distribution was found to be fair. The value of purchased fertilizer per acre was 75 and 66 cts., respectively, in the two years.

By way of a business analysis of individual farms, the total acres operated, the acreage in crops, the number of cows, total capital invested, sales, expenses, and other items are tabulated for each farm for each of the two years. The success of the dairy farms which are rated highest is attributed to efficiency, size, high crop sales, or economical operation.

Strawberries and farm profits in western Kentucky, J. B. HUTSON (*Kentucky Sta. Bul. 255 (1924), pp. 133–171, figs. 11*).—A detailed cost route was maintained in Christian County, Ky., cooperatively by the station and the Bureau of Agricultural Economics, U. S. D. A., from April, 1919, to April, 1924, and, in connection with taking other data, information was obtained from 60 farms with reference to the labor and material requirements for strawberries for the 3-year crop period. For the 1921–1923 crops, most of the growers received from $500 to $1,000 per acre for the three years. For the 1922–1924 crops, most of them received from $300 to $700 per acre. The variations between the receipts for the two crops were due to differences in both yields and prices.

It is concluded that this crop has excellent possibilities in many areas in western Kentucky if undertaken on a small scale. Good cultivation, adequate transportation facilities, and cooperative effort among growers are imperative. Comparisons are made of the labor and equipment needs of and the returns from a corn and tobacco combination and strawberries.

Agricultural bookkeeping in Denmark, E. THOMAS (*Scot. Jour. Agr.,* 7 (*1924*), *No. 4, pp. 390–400, fig. 1*).—The history of the promotion of bookkeeping societies and investigations into farming costs in Denmark is briefly reviewed, and the principles upon which the work is conducted are set forth. Six reports previously noted (E. S. R., 51, p. 890) are commented upon.

Investigations with reference to agricultural business management [trans. title], O. H. LARSEN (*Landøkonom. Driftsbur.* [*Denmark*], *Undersøg. Landbr. Driftsforh., No. 7* (*1924*), *pp. 207*).—Data for the year 1922–23 are tabulated and summarized here, continuing the series of reports previously noted (E. S. R., 51, p. 890).

Tractor operation costs, E. C. SAUVE (*Michigan Sta. Quart. Bul.,* 7 (*1925*), *No. 4, pp. 135–137, fig. 1*).—Detailed costs and related data of two-plow tractor power for nine farm operations on a 100-acre farm in Michigan are recorded here.

The fixing of farm wages, J. F. DUNCAN (*Scot. Jour. Agr.,* 7 (*1924*), *No. 4, pp. 374–380*).—The author gives reasons for the opposition in Scotland to the fixing of minimum wage rates by statutory bodies.

The woodlot tax act, K. DRESSEL (*Michigan Sta. Quart. Bul.,* 7 (*1925*), *No. 4, pp. 161–163*).—The woodlot tax act for Michigan, passed in 1911 and revised and simplified in 1917, provides for the reduction of the valuation of the woodlot to $1 per acre under certain conditions, and it is then taxed at the prevailing rate of the township in which it is located. Ten woodlot owners in Oceana County have made application to have their woodlots listed under this act, nine of which have been accepted. A reduction in valuation is noted in practically every case in comparing them with woodlots not under the act.

Loans to co-operative enterprises (*Jour. Min. Agr.* [*Gt. Brit.*], *31* (*1924*), *No. 5, pp. 480, 481*).—The terms and conditions under which the Ministry of Agriculture for England will make loans to agricultural cooperative societies registered under the industrial and provident societies acts are set forth.

How shall cooperatives be organized? M. O. TOBRINER (*Jour. Farm Econ.,* 6 (*1924*), *No. 4, pp. 367–377*).—The author discusses the argument that an association organized by outside talent can not function successfully because it is built neither upon a spirit of cooperation nor upon local units. It is held that in actual practice it is possible for such organizations to function. Three objections are presented to the claim that a marketing organization should be built upon the basis of local groups in order to preserve local pride. Yet in the end the federated form of organization is held to be the more desirable, even if in practice the less feasible of the two types.

Crops and Markets, [May, 1925] (*U. S. Dept. Agr., Crops and Markets,* 3 (*1925*), *Nos. 18, pp. 273–288; 19, pp. 289–304; 20, pp. 305–320; 21, pp. 321–336; 22, pp. 337–352*).—Abstracts of the week's market reports, special articles of current interest, and tabulated summaries of the market receipts and prices of important classes of agricultural products and specific commodities of current dates, with comparisons, appear in these numbers, together with brief notes on foreign crops and markets.

Monthly Supplement to Crops and Markets, [May, 1925] (*U. S. Dept. Agr., Crops and Markets,* 2 (*1925*), *Sup. 5, pp. 145–168, figs. 3*).—A report on the condition of crops and farm animals as of May 1 and tabulated reports of the estimated price of farm products received by producers in the current year, with comparisons, appear in this issue, together with the usual monthly reports of the livestock and meat situation, the receipts and disposition of livestock at public stockyards, shipments of fruits and vegetables, cold-storage holdings, and miscellaneous items and the review of the price situation.

The price responsiveness of wheat growers, L. S. LYON and T. E. RASSIEUR (*Jour. Polit. Econ., 32 (1924), No. 6, pp. 707-721, figs. 6*).—This inquiry was undertaken in order to ascertain the extent to which the chief controllable factor in wheat production actually functions in relation to price changes. It was deemed necessary to examine, first of all, the relation of acreage sown to price. Six charts are presented in which three assumptions were used, first, that the farmer is most influenced by prices during the actual period of planting and immediately before, the second, that the price throughout the year may be more significant in influencing the farmer, and the third having to do with the relation between acreage and futures prices. The following conclusions concerning price responsiveness are made:

Spring-wheat acreage appears to be much more influenced by price changes than does winter-wheat acreage. Spring-wheat acreage is more influenced by price over the "long period" than it is by price at the time of planting or by the indications of the futures market. Spring-wheat acreage shows a rational relationship to futures price in two cases out of three, a less frequent coincidence than the relation to price changes during the preceding year. The final conclusion is that the growers of winter wheat are little influenced by prices at any time in acreage planting, and spring-wheat acreage shows a definite relationship to price throughout the year.

American economic history, H. U. FAULKNER (*New York and London: Harper & Bros., 1924, pp. [13]+721, pl. 1, figs. 26*).—A chapter on agriculture is found in each of the three sections of this economic history. That in the section on colonial beginnings deals with colonial agriculture and labor, that in the section on economic independence and the advance to the Pacific is concerned with agriculture from the close of the Revolution to the Civil War, while the one in the last section on the topic of industrial expansion and economic development sets forth the agrarian revolution. Important annotated bibliographies are appended to all chapters.

South Wales and the march, 1284–1415, W. REES (*London and New York: Oxford Univ. Press, 1924, pp. XVI+303, pl. 1, figs. 2*).—This is a social and agrarian study based upon original records, the majority of which are unpublished. The period under consideration begins with the final loss of Welsh independence. Part 1 deals with the economic aspects of the conquest of Wales and part 2 with the economic organization of the lordships of Wales. Here the author describes the organization of the castle and the manor which typified the Norman influence in the sections known as the Englishry. The Welshry, on the other hand, consisted of the upland sections in general where native organization and customs prevailed. Part 3 discusses the effect of pestilence and war after 1349.

Highland rural industries, I. F. GRANT (*Edinb. Rev., 241 (1925), No. 491, pp. 167–184*).—An interdependence between agriculture and handicrafts is said to have been typical of eighteenth century rural industries in Scotland, largely on account of the large rural population and the seasonal character of field work. The products of hand spinning and knitting industries were used almost entirely by the rural population. The agricultural revolution and other events brought about an increase in the cultivated land and influenced the decline of these industries. The nineteenth century saw an increasing competition by machinery. After the middle of this century, however, a new demand appeared, and workers began to produce for persons other than those in their own class.

Situation of agriculture in the Soviet Union, [I–III], D. P. PAVLOV (*Russ. Rev., 3 (1925), Nos. 2, pp. 30–34; 3, pp. 52–55; 4, pp. 71, 72*).—The first installment of this paper sets forth the general agricultural conditions pre-

vailing in Soviet Russia. The total acreage sown to food grains is shown to have decreased in 1916 to 90.9 per cent of that of 1913, in 1920 to 71, and in 1922 to 54.6 per cent. In 1923 the acreage increased to 64.9 and in 1924 amounted to 82.4 per cent of the pre-war figure. The efforts of the population and the Government program designed particularly to rationalize methods and increase production are outlined. The second part, entitled Grain Farming in the U. S. S. R., presents statistics of production and exports of grain in prewar and in recent years. The third part reviews the production of potatoes, sugar beets, flax, hemp, sunflower, tobacco, and cotton.

The world wheat situation, 1923–24 (*Food Research Inst.* [*Stanford Univ.*] *Wheat Studies, 1 (1924), No. 1, pp. 58, figs. 6*).—A review of this crop year is presented which brings out certain facts, among which are that wheat prices in terms of gold were lower than at any time since the war, and that wheat values, or wheat prices in terms of purchasing power over commodities in general, were lower than for the previous 30 years. In accounting for this it is pointed out that the initial carry over was ample, world crops were exceptionally large, and wheat substitutes were also plentiful. The international demand for wheat from Europe, from the Orient, and from other regions was greater than had been anticipated. Almost every European country except Germany imported wheat heavily. The 1923–24 crop in the United States yielded less per acre and was below average in quality. The acreage harvested was also less than in recent years and with low prices and fairly high costs per bushel the financial return from the crop was exceptionally small. Exports rapidly declined, and throughout most of the year American grain, except durum and Pacific white wheats, was scarcely a factor in the international market. The current year is said to present a number of striking contrasts to 1923–24, neither of which may be considered typical. The appendix contains tables relating to wheat supplies, movements, and prices.

The food supply of New England, edited by A. W. Gilbert (*New York: Macmillan Co., 1924, pp. IX+273, figs. 4*).—The history of agriculture in New England and geographical and physical factors affecting it, also the sources and amounts of the principal foods consumed and some of the problems of food marketing there, are set forth in early chapters of this volume, prepared under the auspices of the executive committee of the New England Agricultural Conference. Educational helps to agriculture, Government and regulatory assistance, farmers' organizations, and commercial helps on the one hand and on the other the factors that hinder agriculture are discussed.

While some aspects of the situation are discouraging, many marks of progress and betterment are found. A number of surveys of farms in typical localities and communities are noted. Specialized farming is deemed desirable as far as markets for the products are available. The production of fresh milk is held to be a very real opportunity, as well as the production of high-class eggs at fancy prices. It is thought that the tobacco acreage can expand only as markets develop. Fruits, especially berries, and vegetables are to be encouraged.

The final chapter gives a summary of the long-time programs formulated by each commodity committee of the agricultural conference.

American village studies, I–IV (*New York: Inst. Social and Religious Research, 1924, pts. 1, pp. [2]+32, figs. 6; 2, pp. [2]+33–64, figs. 3; 3, pp. [2]+65–119, figs. 4; 4, pp. [2]+121–152, figs. 2*).—These studies were carried on under the direction of E. de S. Brunner early in 1923.

I. *A census analysis of Middle Atlantic villages*, C. L. Fry.—This presents an analysis of 1920 census data for 34 villages, 18 of which are situated in New York State, 15 in Pennsylvania, and 1 in Maryland. Tables show in detail the

composition, characteristics, and occupations of the population of each village. A summary tabulation brings out the comparisons between these villages and a group of representative cities near by. Comparisons are made also between the villages in New York State and those in Pennsylvania. These villages were found to be characterized by a relatively homogeneous American population with a preponderance of older persons among the inhabitants and an excess of females as compared with males. They exhibited better school attendance records and set higher standards of home ownership than did the cities. In the main their populations were engaged in industrial rather than in agricultural occupations.

II. *A census analysis of southern villages*, C. L. Fry.—This study is concerned with 44 villages located in 11 Southern States. The section is divided into two areas, including 9 villages in Texas and Arkansas under the term "the Southwest" and 35 villages located in the other Southern States designated the Old South. The outstanding characteristic of the composition of the village population in this region is the large precentage of negroes. In order to determine the extent of the differences in the composition, characteristics, and occupations of the two races special tabulations were compiled to show certain facts for whites and negroes separately.

The distribution of village populations by sex and age was found to be remarkably normal. The marital conditions of village and city dwellers in this region were almost identical. In school attendance the villages make a better record than the cities, especially for the older boys and girls. Illiteracy, however, is, except among the native whites, higher in the villages than in the urban centers. These villages are held to be quite different in several important respects from those analyzed in the above.

III. *A census analysis of middle western villages*, C. L. Fry.—The data presented here pertain to 65 villages, of which 11 are in Iowa, 8 in Illinois, 7 each in Wisconsin, Missouri, Nebraska, and Kansas, 5 each in Indiana and Minnesota, and 4 each in Michigan and North Dakota. The tables present separate subtotals both for the 24 villages situated east of the Mississippi River and for the 41 west of it. They were found to be characterized by a diversity of racial elements in the population, the proportion of persons of foreign birth and of foreign extraction being as high as in the adjacent cities. The high rate of home ownership and of school attendance, together with the comparatively low proportion of people gainfully employed, is held to testify to a high economic standard of life.

IV. *A census analysis of far western villages*, C. L. Fry and G. S. Hughes.—An analysis of 1920 census data for 34 villages in 6 Western States constitutes the basis of this discussion. Seven of the villages are in the range States of Colorado, Montana, and Idaho, while the remainder are in the Pacific States of California, Oregon, and Washington. It was found that, although both urban and rural areas in the far West have gained in population far more than has the entire United States during the last decade, village growth in the Pacific section has not kept pace with division increase; but in the range section the villages selected for study have outdistanced the division. The growth of population in these villages has come through migration of native-born individuals, males outnumbering females, rather than through natural increase. The Oriental population of these villages was found to be very small.

Wyoming agricultural statistics, F. W. Beier, Jr., and A. D. Faville (*Wyo. Agr. Statis.* [*Wyo. Dept. Agr.*], *No. 1* (*1923*), *pp. 48*).—The first published statistics and general information with regard to Wyoming agriculture to be presented jointly by the Wyoming State Department of Agriculture and the U. S. Department of Agriculture are presented here.

Canadian grain trade year book, 1923–24 (*Winnepeg: W. Sanford Evans Statis. Serv., 1924, vol. 4, pp. 92*).—Statistics for the later year are added to the series previously noted (E. S. R., 50, p. 693).

Statistics of the production of cereals and legumes in 1924 (*Estadística de la Producción de Cereales y Leguminosas en el Ano 1924. Madrid: Consejo Agron., 1924, pp. [38]*).—Tabulated statistics for the later year continue the series of reports previously noted (E. S. R., 50, p. 795).

Statistics of the harvested and planted areas of the principal native crops for the years 1916 up to and including 1922 [trans. title] (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Statis. Kant. No. 15 (1924), pp. XX+187, figs. 14*).—Tables with interpretative notes present returns of agriculture in Java and Madura as reported by special crop correspondents.

AGRICULTURAL EDUCATION

Some lessons learned from a decade of rural supervision, A. Reynolds (*U. S. Bur. Ed. Bul. 9 (1925), pp. III+19*).—The author traces the development of this factor in the improvement of rural school teaching, points out some of the good effects which have resulted, and discusses problems and agencies helpful in promoting successful rural supervision.

The improvement of rural schools by standardization, E. A. Lathrop (*U. S. Bur. Ed., Rural School Leaflet 32 (1925), pp. IV+28, figs. 11*).—Data obtained by a study of the school laws of the various States, reports and bulletins issued by State departments of education, and tabulated replies to questionnaires received from State superintendents and by correspondence and personal visits are summarized. The author discusses the essential details of standardization in 34 States and sets forth the content of the score card, defining minimum standards in 30 States. A few statements are reproduced which indicate some of the achievements of standardization, and a brief bibliography is included.

A study of 260 school consolidations, J. F. Abel (*U. S. Bur. Ed. Bul. 32 (1924), pp. IV+39, pls. 4, figs. 4*).—The replies to a questionnaire sent out in January, 1923, furnish the material upon which this study is based.

It was determined that the typical consolidation serves an area of 36 square miles, with an assessed valuation of $1,250,000. The school plant, including grounds of at least 5 acres in extent, is valued at $57,000. The annual income is $22,450, or from $80 to $84 for each child enrolled, $91 to $95 for each child in average daily attendance. The typical consolidation school enrolls 204 children in the elementary grades, 76 in the high school. The attendance is 91 per cent of the enrollment. The teaching staff of 11 persons is divided on a basis of 6 or 7 for the elementary grades and 5 or 4 for the high school. At least 6 of the staff are normal school or college graduates, and 9 have had more than 2 years of experience. For the typical conolidated school five transportation routes are maintained, and 110 of the children are conveyed to and from school, an average of 4.7 miles one way, in 35 minutes, at a cost of 3.8 cts. per child per mile per day. In the school building are rooms equipped for giving special subjects and an auditorium with a seating capacity of 400.

Preparation of teachers for rural consolidated and village schools, L. J. Alleman (*U. S. Bur. Ed., Rural School Leaflet 38 (1925), pp. 8*).—The plan of observation and practice teaching used in the Louisiana State Normal College is set forth here.

Methods of teaching as applied to vocational education in agriculture, A. P. Williams (*Fed. Bd. Vocat. Ed. Bul. 103 (1925), pp. V+49*).—Specific studies and interpretations of methods and principles of teaching vocational

agriculture on the farm job basis are presented here. Outlines have been drawn up in detail of lessons on the farm jobs of testing seed corn for germination and root rot by the rag-doll method, computing the composition and value of fertilizer mixtures for growing wheat, the application of fertilizers in growing corn for grain, and buying seed corn. These lessons are regarded as representative, respectively, of jobs requiring predominantly manipulative abilities, mental activities by standard procedure, and standard procedure in information getting and in constructive thinking. In discussing principles the topics covered are the selection of teaching units, lesson planning, and the use of analysis of standard practice.

Promoting vocational education in agriculture, P. W. CHAPMAN (*Fed. Bd. Vocat. Ed. Bul. 97 (1925), pp. IX+67, figs. 36*).—The basis for a program of promotional activities is discussed under the heads of the groups to be reached, material to be presented, and methods to be used. Suggestions are offered to the teacher of vocational agriculture with regard to speaking in public and writing for the press. Agricultural exhibits and the preparation and use of illustrative material are discussed, together with miscellaneous special activities of the teacher.

Principles in making the vocational course of study in agriculture in the high school, T. H. EATON (*Fed. Bd. Vocat. Ed. Bul. 98 (1925), pp. VII+21*).—This discussion is addressed to vocational teachers of agriculture, teacher-training teachers, and to State supervisors, suggesting objectives, procedure, and criteria to be observed in formulating the agricultural part of a vocational curriculum in the high school.

Student teaching in agriculture, B. E. BARRINGER (*Fed. Bd. Vocat. Ed. Bul. 100 (1925), pp. XI+124*).—The development of the organization and administration of teacher training in vocational agriculture, the size of teacher-training departments, the training and experience of methods teachers, curricula and courses in the teaching of agriculture, and special provisions for observation and for resident and apprenticeship student teaching are described. The author has used information gained from personal visitation, conferences, and published and unpublished reports and studies dealing with this subject.

Publications of the United States Bureau of Education pertaining to rural education, F. E. REYNOLDS (*U. S. Bur. Ed., Rural School Leaflet 36 (1924), pp. 23*).—This list includes the publications for the years 1908 to 1924, inclusive, giving a brief abstract of the content of each.

A history of agriculture in Europe and America, N. S. B. GRAS (*New York: F. S. Crofts & Co., 1925, pp. XXVII+444, figs. 6*).—The author describes for general and collegiate use some of the phenomena in the history of rural life and discusses some of the general evolutionary changes.

Judging livestock, D. A. JAY and B. W. FAIRBANKS (*Colo. Agr. Col. Ext. [Bul.] 217A (1924), pp. 24, figs. 21*).—This constitutes a handbook for use in teaching livestock judging.

Marketing poultry products, E. W. BENJAMIN (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1925, 2. ed., rev., pp. IX+332, pls. 7, figs. 136*).—This is a second edition, revised, of a textbook previously noted (E. S. R., 51, p. 95).

North America, L. R. JONES and P. W. BRYAN (*London: Methuen & Co., Ltd., 1924, pp. XIII+537, pl. 1, figs. 103*).—Parts 1 and 3 of a geographical treatise and reference book deal with historical and regional geography and part 2 with economic geography.

Sources of useful information for the teacher of home economics, E. S. WHITCOMB (*U. S. Bur. Ed., Home Econ. Circ. 19 (1924), pp. 18*).—A brief annotated list of references is presented in sections on educational objectives,

health, citizenship, the junior high school, the senior high school, educational measurements, general and vocational home economics, subject matter pertaining to foods, clothing, and shelter, city and State home economics courses of study, school finance, illustrative material for the teaching of home economics, and current literature available.

Clothing for women, L. I. Baldt (*Philadelphia and London: J. B. Lippincott Co., 1924, 2. ed., pp. XIV+454, pls. 8, figs. 262*).—This is the second edition of the text previously noted (E. S. R., 36, p. 497).

Problems in teaching clothing selection to young girls, A. L. Van Duzer (*Jour. Home Econ., 16 (1924), No. 8, pp. 423–427*).—Problems arising in the teaching of the suitability of materials are briefly noted.

MISCELLANEOUS

***The Thirty-seventh Annual Report of the Maryland Agricultural Experiment Station,* [1924],** H. J. Patterson (*Maryland Sta. Rpt. 1924, pp. XIX+300, figs. 77*).—This contains the organization list, a report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1924, and reprints of Bulletins 256–267, all of which have been previously noted. In addition to experimental work with field crops, noted on page 332, brief notes are given on fertilizer tests with peaches, apples, rhubarb, and sweet potatoes; pruning trials with grapes; and variety tests with asparagus.

Report of the work at the Raymond Branch Experiment Station, C. B. Anders (*Mississippi Sta. Bul. 224 (1924), pp. 16*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Dickinson Substation Report for 1922 and 1923, L. Moomaw (*North Dakota Sta. Bul. 189 (1925), pp. 46, figs. 8*).—This bulletin consists of the report of this substation for the years 1922 and 1923. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Work of the Umatilla Reclamation Project Experiment Farm in 1920, 1921, and 1922, H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 342 (1925), pp. 24, figs. 6*).—The experimental work reported as carried on at this farm, located near Hermiston, Oreg., is for the most part abstracted elsewhere in this issue.

Work of the Belle Fourche Reclamation Project Experiment Farm from 1919 to 1922, inclusive, B. Aune (*U. S. Dept. Agr., Dept. Circ. 339 (1925), pp. 48, figs. 10*).—The experimental work reported as carried on at this farm, located near Newell, S. Dak., is for the most part abstracted elsewhere in this issue.

Information regarding recent publications (*Kansas Sta. Circ. 111 (1925), pp. 4*).—Brief abstracts are given of Bulletins 232–234 and Circulars 101, 102, and 105–110, all of which have been previously noted.

The Quarterly Bulletin [of the Michigan Station], edited by R. S. Shaw and E. B. Hill (*Michigan Sta. Quart. Bul., 7 (1925), No. 4, pp. 121–166, figs. 12*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Michigan's Agricultural Departments; Improving the Appearance of the Home, by H. J. Gallagher; and Miscellaneous Root Crops, by C. E. Cormany.

Fourth report on organization in industry, commerce, and the professions in Canada (*Ottawa: Canada Dept. Labor, 1925, pp. 115*).—The organizations listed in this compilation include subdivisions on agriculture, dairying, horses, livestock, sheep breeding, cooperative societies, technical and scientific organizations, etc.

NOTES

Kentucky University and Station.—Dedication exercises for the Western Kentucky Substation were held at Princeton September 7, and for the Robinson Substation at Quicksand, September 11.

A department of home economics has been created in the station, effective September 1, with Miss Mariel Hopkins as head and Miss Erikson as assistant. Investigations have been begun under the Purnell Act. Marie Barkley has been appointed instructor in home economics in the university, beginning September 1.

D. A. Sanders and E. A. Caslick, assistant veterinarians, resigned July 1 and August 16, respectively, and Ethel Snyder, laboratory assistant in veterinary science, on September 1. The following assistants in the station have recently been appointed: Thomas Baird in farm management July 1; Philip Edwards, Ph. D., in bacteriology July 15; F. E. Hull, D. V. M., in veterinary science August 26; and E. C. Johnson in marketing September 1.

American Society of Agricultural Engineers.—The nineteenth annual meeting of this society was held at Madison, Wis., June 22–25.

The first day of the meeting was devoted to inspection trips and demonstrations on the university farm. These included a horse pulling contest, a demonstration of a belt dynamometer on a silo filler, an inspection of the drainage system at the university marsh, and demonstrations of rock blasting by two different methods and of marsh plowing with a special plow.

On the second day programs were presented simultaneously by the three technical divisions of the society, farm power and machinery, reclamation, and farm structures. In the farm power and machinery division L. Wallace gave a report on Depreciation of Farm Machinery, based on studies conducted jointly by the agricultural and engineering experiment stations of Iowa, and containing data on the average and probable maximum life of certain machines. H. H. Musselman reported on the development of equipment for handling marl at the Michigan Station, and a similar report on the work on wind power electric plants at the Iowa Station was made by F. C. Fenton. H. R. Burr presented the report of the committee on farm products, and A. P. Yerkes reviewed the present status of power farming, drawing attention to some of the more recent and outstanding developments. The program was closed by R. H. Black, of the U. S. Department of Agriculture, who discussed the relation of agricultural engineering to better grades and higher prices of grain, and referred especially to the importance of efficient grain cleaning and grading equipment in this connection.

In the reclamation division E. G. Amos described some actual results of timber growing in Michigan. S. H. Beckett, of the California Station, discussed some of the agricultural engineering problems of western irrigation practice; H. J. Andrews described the Michigan land economic survey; and G. R. Boyd, of the U. S. Department of Agriculture, presented a paper on The Value of War Explosives Distribution. Reports of the committees on drainage were presented by J. R. Haswell of Pennsylvania State College; land colonization, by D. Weeks; permanent timber supply, by H. H. Musselman; land clearing, by L. F Livingston; and soil erosion, by E. W. Lehmann of the Illinois Station.

A report to the farm structures division of studies on factors influencing the flue velocities in barn ventilation, by M. A. R. Kelley of the U. S.

Department of Agriculture, brought out the fact that the difference between inside and outside temperatures is one of the predominating factors in this connection. C. W. Smith made a progress report of studies at the Nebraska Station on poultry house ventilation, with particular reference to its influence on egg production and the health of poultry, the purpose being to establish some of the optimum conditions for poultry housing for use as a basis for design. Among the more important results, it was brought out that relative humidity varied inversely as the temperature under certain conditions, but that a widespread variation in humidity made no comparable difference in egg production. The beneficial influence of lights on egg production in the winter was also quite definitely shown. H. Giese presented a paper on Automatic Temperature Control for Poultry Houses which was based on studies in progress at the Iowa Station on the fundamental factors governing the optimum ventilation of poultry houses.

H. T. Greene discussed the important features of practical dairy barn planning, and W. D. Brinckloe farmhouse design from the standpoint of the requirements of the farm woman. G. M. Hunt, of the U. S. Department of Agriculture, presented a paper on Getting More Service Out of Wood, which was based upon some of the work in progress at the Forest Products Laboratory. The report of the committee on farm building code was given by W. A. Foster of the University of Illinois.

The third day was devoted to a general session. The president's address, given by H. B. Walker of the Kansas College, was followed by discussions on Engineering Aspects of Some Forestry Problems, by R. Zon of the Lake States Forest Experiment Station, and on the Relation of the Agricultural Engineer to Land Economics, by R. T. Ely of the University of Wisconsin. D. Scoates, of the Texas College, spoke on European Observations of an Agricultural Engineer, and Dean H. L. Russell, of the University of Wisconsin, presented an address entitled Farm and Factory Related, based largely on his observations of agricultural conditions and practices during a recent tour of some of the British possessions. F. P. Mount, representing the National Association of Farm Equipment Manufacturers, discussed the relations of the agricultural engineer and the farm equipment manufacturing industry, J. R. Howard the relation of agricultural engineering to agricultural development, and A. Huntington some of the problems in rural electrification. Dr. G. Kühne, of the Munich Technical Academy in Germany, described his impressions of agricultural engineering development in America, gained during a tour of the United States during which he visited many of the leading State agricultural colleges and experiment stations. The session was closed by the report of the research committee presented by R. W. Trullinger of the Office of Experiment Stations.

The final day of the meeting was devoted to the college division program. Papers were presented by C. O. Reed and H. W. Nisonger, of the Ohio State University, entitled, respectively, A Summary of Agricultural Engineering Education of Previous Years, and Redirection of Teaching Procedure in the Light of Modern Psychology; and by H. B. Walker, of the Kansas College, on Opportunities and Requirements for Cooperation. There were also several general discussions on cooperative relationships, these including cooperation with the farm equipment, the electrical, and the building materials industries, cooperative education, and cooperation in research.

Officers for the ensuing year were elected as follows: President, F. A. Wirt; first vice president, J. Swenehart of the Wisconsin Station; second vice president, M. A. R. Kelley; and member of the executive council, C. O. Reed.

EXPERIMENT STATION RECORD

Vol. 53 October, 1925 No. 5

Another interesting contribution to the steadily lengthening list of historical narratives of the land-grant colleges has recently been prepared by the Federal Bureau of Education. It takes the form of a series of five bulletins of that bureau under the general title of Land-Grant College Education, 1910–1920. Of the various parts, the first deals with the topic of history and educational objectives, the second with the liberal arts and sciences (including miscellaneous subjects and activities), the third with agriculture, and the fourth with engineering and mechanic arts, while the fifth, which is still in press, takes up home economics. The various parts are further subdivided into brief articles covering specific phases of the subject and contributed by over 65 specialists and leaders in these and related institutions. In this way a comprehensive survey of the field from a variety of viewpoints has been made possible.

The period on which this survey is based is well recognized as one of the most important in the entire history of the land-grant institutions. It opens with such outstanding events as the unprecedented growth in numbers and popular esteem of the colleges of agriculture and the continued interest in the mechanic arts, the passage of the Smith-Lever Act in 1914, and the development of the elaborate extension organization, and it includes the period of expansion of the experiment stations under the impetus of the Adams Act of 1906 and the largely increased appropriations in most of the States. It embodies the entire era of the World War with its far-reaching influence upon these institutions. It closes with the momentous days of postwar readjustments. A statistical summary assembles data of great value and significance regarding all these matters. In some of the separate articles, however, the period has been defined less arbitrarily, references to previous and subsequent happenings being freely incorporated whenever deemed desirable for an adequate discussion.

The bulletins reveal in striking fashion the material progress and important position of the land-grant institutions. They show that in 1919–20 these colleges were educating approximately one-third of all college or university students in the United States and three-fourths of all those trained at colleges and universities under public

control. Their annual receipts for that year amounted to $83,325,28(or more than one-third of those for all higher institutions of learn ing, while the value of their plant, grounds, and equipment wa $168,460,589, or about 26 per cent of the total.

On a comparative basis it is reported that their teaching staff increased during this period by 121 per cent, reaching a total o 15,803 persons, while the student enrollment rose to 148,997, an increase of 88 per cent. Their property increased in value by 9(per cent and their libraries in size by 61 per cent.

In many respects these advances were especially noteworthy fo the colleges of agriculture, though for the most part the data hav not been sufficiently segregated for discussion. Omitting the insti tutions exclusively for the colored race, the student enrollment in four-year agricultural courses rose during the decade from 7,69(to 16,114, the degrees conferred annually from 886 to 2,296, and the advanced degrees from 83 to 321. For the colored institutions the increase was relatively much smaller, the enrollment in agriculture rising from 8,138 to 11,527.

The period was noteworthy for a number of conspicuous appropriations for buildings, equipment, and support, thereby reflecting the increased appreciation of their work by legislatures and the general public. Concerning this phase of the matter, President Pearson and Vice Director Stevenson of Iowa, in an article entitled A Survey of Agricultural Education in Land-Grant Colleges, make the following comments:

"The fact that Congress and State legislatures are willing to make liberal appropriations for agricultural education of college grade is adequate proof that the agricultural colleges of the country have justified their creation and merit confidence and support. These colleges, however, have had a long struggle for recognition. They have been compelled to fight on in the face of many and varied difficulties. They have had to train their teachers gradually; develop material suitable for their curricula; build up departments and courses of study; overcome the active opposition of a large number of farmers; and win the support of certain educators who looked upon the agricultural college as a menace to educational progress. But the colleges have achieved notable successes along all of these lines. Their future usefulness is now assured. If adequate funds are placed at their disposal, they will certainly grow in influence and in helpfulness, and will train an ever-increasing number of men and women for useful service to society and in the field of agriculture."

Attention is drawn by the same writers to the unusual interest which has prevailed as to the improvement in methods of agricultural instruction and the extensive modifications in curricula which

have been made and are still in progress. They find a great increase in the quantity of dependable agricultural information, both scientific and practical, discovered for the most part by the experiment stations and availed of approximately as fast as it could be put into teachable form. For this purpose an extension of the elective system and a tendency toward a wider range of choice in the matter of specialization is noted. Strong, well-organized courses in agricultural education, farm management, agricultural economics, agricultural journalism, and rural sociology have been introduced, and many new courses have been provided along somewhat narrow technical lines to meet the prospective needs of students upon graduation.

Marked improvement is also seen in the facilities and opportunities provided for graduate work in agriculture. Although still handicapped in some colleges by shortage of funds, overcrowded classrooms and laboratories, and overworked faculties, it is believed that at least in the older and larger colleges this has emerged from the realm of small beginnings and slow development and become firmly established on a solid footing.

During the decade certain tangible achievements of the colleges were brought out more clearly than ever before. As Pearson and Stevenson point out, their main purpose has come to be recognized as the training of leaders, and "the most unfriendly critic of agricultural education must admit that a very large percentage of the graduates of American agricultural colleges have 'made good,' not only on the land but also in many and varied lines of work which have offered opportunities for leadership and unselfish service in the general field of agriculture." The records show that a very large proportion of the thousands of teachers of agriculture in colleges and secondary schools, experiment station workers and county agents, and other engaged in extension activities have been educated in these institutions, and their training in ever-increasing numbers has been one of the outstanding achievements. The colleges have also, however, had a direct and far-reaching influence on agricultural production, especially food production during the war period, becoming at this time an agency of great helpfulness in this important part of the Nation's program for winning the war. "As a result of their unqualified success in this venture, they further intrenched themselves in the confidence of Government officials and of the people of the whole country."

Much credit is given the agricultural colleges for what they have done in bringing about a change in the viewpoint and the attitude of large groups of both city and country people toward the farm and the problems of the farmer. The intimate relationship and essential community of interest between agriculture and general business has been demonstrated quite forcibly and effectively. The teaching

of the colleges has also encouraged farmers to organize to study their problems of finance, transportation, and marketing and otherwise to establish farming on a sounder economic basis.

As to the future, it is shown that "through the activities of these institutions, there has been developed a rich fund of subject matter for use in all grades of agricultural schools from the college to the one-room rural school. Secondly, through the efforts of these colleges, large numbers of men and women have been trained for efficient service in agricultural teaching and research; practically every one of them is prepared to do something for the further development of agriculture. There is large promise for the future in this fact, for without doubt the outstanding handicap of college and station work in the past has been a shortage of competent teachers and investigators."

The prospective usefulness and progress of the colleges are thought to be largely dependent upon the extent to which their physical and financial problems are solved. "Most of our agricultural colleges now have wise and competent leadership, and loyal, well-trained faculties; their needs in the future will center primarily on money, land, and equipment." The modern agricultural college is a relatively expensive plant, requiring large sums of money for its functioning in an adequate way. Its needs have been accentuated by the overcrowding of students and the postponement of needed improvements in many States during the postwar period.

Some of these handicaps are further discussed in an article on the development and present status of the agricultural experiment stations and extension services, contributed by Dr. A. C. True, formerly director of the States Relations Service. Doctor True describes the decade following the passage of the Adams Act in 1906 as a period of great prosperity for the stations, with considerable increases in State funds, personnel, and equipment, and characterized by the undertaking of a large number of the more thorough basic investigations and the broadening and strengthening of the more practical phases. The establishment, with State funds, of numerous substations and outlying experiments also enabled them to meet more fully the requirements of different agricultural regions and brought them closer to the farming people on a large scale.

Unfortunately, as is pointed out, the entrance of the United States into the World War seriously checked this progress. "Some of the station officers went into the military service, some engaged in researches or other work made necessary by the military requirements, others undertook extension work to stimulate agricultural production. The great rise in living expenses and in the price of

equipment and supplies needed for agricultural research stopped or hindered important lines of the station work, especially since the funds available for research were not materially increased. A diminished supply of well-trained agricultural teachers and investigators increased once more the number of workers who divided their time between research and teaching or extension work. These and other difficulties caused by the war have not yet passed away."

Another factor which temporarily obscured the importance of the station work was the rapid expansion of the agricultural extension work of the colleges after the passage of the Smith-Lever Extension Act of 1914. The great popularity of this enterprise caused relatively large amounts of public funds to flow in this direction. In some instances, also, the use of station funds for farm operations not contributing to research absorbed much of the gross income of the stations.

Mention is made of the urgent demand for more thorough and comprehensive investigations in agricultural economics and home economics which has developed in increasing degree but which could not be met without a material enlargement of funds. Fortunately, an opportunity for alleviating these unfavorable conditions is now available through the passage of the Purnell Act.

The efficiency of the station work was materially augmented by the introduction and ultimate adoption of the project basis of organization. Among the more outstanding accomplishments of the station work are mentioned the fundamental studies on animal nutrition, especially in connection with the vitamins, the discovery of the relation of leafhoppers to curly leaf of sugar beets and tipburn of potatoes, the material progress in soil investigations, the development of such improved strains of cereals and other crops as Kanred wheat, Rosen rye, Connecticut round-tip tobacco, and Hubam sweet clover, further knowledge of hog cholera, contagious abortion, and of poisonous range plants, and the introduction of sunflowers as a silage crop. The economic benefits of these advances in knowledge are difficult to compute on a cash basis, but are unquestionably far in excess of the entire cost of the stations.

The development of extension work is described, especially its organization on a permanent national basis. It is stated that in 1920 the extension workers directly aided the improvement of farm and home practice of 1,200,000 farmers, 400,000 farm women, and 445,000 farm boys and girls at a total cost of 75 cts. for each $1,000 of gross returns from agricultural production in the United States. From 1914 to 1917 much emphasis was necessarily laid on strengthening and broadening the extension organization and establishing

more intimate contacts with farming people. Of the war period the following is said:

"The extension force was greatly expanded. County agricultural agents were located in over 2,400 counties, home demonstration agents in 1,700 counties and in 200 cities. Great numbers of children were enrolled in clubs. Thousands of gardens were successfully grown in urban and country communities, and great stores of food were canned and otherwise preserved. People were taught how to use foods to which they had not been accustomed and to make their food supplies go much further toward their sufficient nourishment than they had previously thought possible. But the largest contribution of the extension forces was in heartening and aiding the patriotic farm men, women, and children in their wonderfully successful task of speeding up agricultural production in spite of the withdrawal into military service of millions of the most vigorous farm workers."

In the days of postwar readjustment economic questions became increasingly prominent, and in addition to problems of agricultural production the extension agents came to deal with a great variety of matters connected with the cost of production, standardization, storing, transportation, and marketing of farm products, the purchase of farm supplies, the farmer's labor income, keeping of farm and home accounts, organization and conduct of cooperative associations, and the like. Ultimately the extension system came to contribute greatly to the nation-wide spread and great importance of the organization of the farming people through farm bureaus and similar groups dealing with business matters and the promotion of legislation in the interest of agriculture and country life. This has resulted in a general recognition of the desirability of confining the work of the extension agencies and others receiving support from public funds to "the giving of instruction and practical demonstration in agriculture and home economics," as provided in the Smith-Lever Act. With this policy well established throughout the country, the extension work will be a permanent system of practical education for farming people supplementary to their systematic education in schools and colleges.

Special chapters are included for the various divisions of subject matter, teacher training, short courses, and vocational agriculture, and in these chapters some frank criticism and many constructive suggestions are included. Emphasis is directed by several writers toward the need of a more thorough grounding of college students in the fundamental sciences, even though this retards or eliminates some of the overspecialization which has been developing.

In research a distinct trend from the superficial to the fundamental type is noted with approval. Thus, as regards vegetable gardening, Professor Work of Cornell University points out that while the early tendency was to seek the best practice by routine methods, "more recently the need for a broader foundation has been realized, and there is now a tendency toward the type of research which seeks to understand the principles lying beneath the observed outward manifestations, striving to discern the various links in the chain of causation which lie between the initial treatment and the final effect."

In poultry husbandry, Professor Lippincott of Kansas argues for a similar redirection of aim in both investigations and classroom instruction. "There will always be," he says, "as there should be, poultry experiments of an immediately practical nature in progress at most agricultural experiment stations. In the long run, however, practical applications are by-products of fundamental researches, and the goal of poultry husbandry research should be the discovery of principles as well as the development of methods and practices." He goes on to say that such a redirection will necessitate a better trained personnel on investigational staffs and a safeguarding of the researchers from undue responsibilities of instruction and administrative duties.

The further development of research is regarded as the most urgent need in agricultural engineering by Professor Davidson, of Iowa, who feels that this phase has not kept pace with the work of instruction. As he says, "with the development of more complicated equipment and the greater demand for efficiency, the uncertain rules of procedure or rule-of-thumb methods can not be used. It is true there is a great fund of well-established general engineering principles and information which may be applied to the agricultural industry; but, on the other hand, many, if not most, of the engineering problems of agriculture are of a special character and require special study and investigation for their solution."

Although some disturbing influences are noted, as in the veterinary profession, a general note of optimism runs through the bulletins, and as a whole the outlook for the future is considered by the various writers to be very encouraging. This is most gratifying, for in the decade under review not a little occurred that was disheartening. Many of the handicaps are being removed, however, and it may well be that the story of the decade through which we are now passing will be a record of even greater achievement.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Chemistry and the State, R. ROBERTSON (*Brit. Assoc. Adv. Sci. Rpt., 92 (1924), pp. 53–88*).—Of particular interest in this discussion of the connection of the departments of State in Great Britain with chemistry are the sections on the relation of chemistry to health and to agriculture. In both of these sections a historical summary is given of the chemical activities of the State before and during the war, with the principal lines of activities at present under way. The section on agriculture is largely a history of the development of the scientific study of agriculture in England, chiefly at the Rothamsted Station, and of the expansion during the war along the lines of feeding stuffs and fertilizers.

An introduction to the literature of chemistry for senior students and research chemists, F. A. MASON (*New York: Oxford Univ. Press, Amer. Branch, 1925, pp. 41*).—Part 1 of this pamphlet, which has been prepared for the use of research workers in chemistry, lists with brief comment useful reference material classified under dictionaries and encyclopedias, chemical journals and periodicals, abstract journals, textbooks and special works of reference (arranged by subject), and special literature of dye chemistry. Part 2 contains brief suggestions for searching the literature on special problems in organic, inorganic, and physical chemistry.

Chemical investigation of the amylases and related enzymes, H. C. SHERMAN (*Carnegie Inst. Wash. Yearbook 23 (1923–24), pp. 243–245*).—This progress report (E. S. R., 51, p. 804) discusses chiefly the significance of the results obtained in the investigation by Sherman, Thomas, and Caldwell of the isoelectric point of malt amylase (E. S. R., 53, p. 106) as furnishing additional evidence of the protein nature of enzymes and adding a new method for the investigation of the physicochemical nature of enzymes.

Attempts at identifying vitamin A.—Vitamin A and phytol [trans. title], M. JAVILLIER, P. BAUDE, and S. LÉVY-LAJEUNESSE (*Bul. Soc. Chim. Biol., 7 (1925), No. 1, pp. 39–51, figs. 4*).—Essentially noted from another source (E. S. R., 53, p. 10).

Efficient drying oven devised (*Wisconsin Sta. Bul. 373 (1925), p. 66, fig. 1*).—A diagram is given of a new design, by H. H. Sommer, of a vacuum oven for dairy analyses, by which it is claimed that a temperature of from 99 to 100° C. can readily be maintained by the use of steam under atmospheric pressure. By means of a water pump, a partial vacuum is secured in the oven, which hastens the drying process.

Notes on the filtration and other errors in the determination of the hydrogen ion concentration of soils, W. R. G. ATKINS (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1924), No. 44, pp. 341–347*).—The experience of the author concerning errors due to variations in technique in the determination of the H-ion concentration of soils is summarized briefly, with experimental data illustrating the points in question.

In preparing the soil extract, a proportion of 1 part of soil to 2 of water is recommended for lightly buffered acid soils and a 1 to 5 proportion for other soils. Precise weighing out of the proportions is not considered necessary as a general rule. For obtaining a clear extract centrifuging is recommended. If the extract is filtered, large volumes should be used and filter paper appropriate to the particular soils. Unextracted papers act toward indicators as if slightly alkaline, pH 7 to 7.6, and acid-extracted papers acid, pH 4.8. Bromocresol green is recommended in place of methyl red, and for the other ranges the usual indicators of the Clark and Lubs series.

Inhibition of bumping in the determination of nitrogen in soil, F. E. HANCE (*Jour. Amer. Soc. Agron., 16 (1924), No. 12, pp. 790, 791, fig. 1*).—The device employed by the author for preventing bumping in the digestion of soils with sulfuric acid in the determination of nitrogen consists in placing the Kjeldahl distilling flask on an asbestos collar or cylinder, which in turn rests on the wire gauze over the flame. The flask is thus heated by hot gases passing up through the asbestos collar, and local heating is prevented. The addition to the distilling flask of 2 gm. of nitrogen-free zinc is said to improve still further the regularity of the boiling. With the improvements thus afforded, it is said to be possible to obtain accurate results with as small an amount as 2.8 gm. of the soil.

The identity of gluten proteins from various wheat flours, M. J. BLISH and A. J. PINCKNEY (*Cereal Chem., 1 (1924), No. 6, pp. 309–316*).—The conclusion drawn by Woodman (E. S. R., 49, p. 308), that differences in the configuration of the glutenin molecules of various flours are responsible for differences in flour strength, has been tested by an examination by the same method of seven samples of pure glutenin from widely different types and varieties of American wheat. Six of the samples, including flours of both high and low baking quality, were identical in their racemization rates in alkaline solution. The exception was a glutenin from Polish wheat of poor baking quality. Three samples of pure gliadin were examined in the same way. Of these, the one from the same Polish wheat differed slightly from the other two, which were identical.

These results are thought to indicate that variations in flour strength can not be attributed to differences in configuration of the glutenin molecule, but are probably due to differences in the state of molecular aggregation, as suggested by Sharp and Gortner (E. S. R., 51, p. 803), or to the influence of electrolytes or other unrecognized substances in the glutenin, as suggested by the work of Upson and Calvin (E. S. R., 36, p. 862).

The quality of gluten of flour mill streams as determined by the viscosity of water suspensions, J. HENDEL and C. H. BAILEY (*Cereal Chem., 1 (1924), No. 6, pp. 320–324*).—Data are reported on the gluten quality, as determined by the viscosity method described by Gortner (E. S. R., 53, p. 314), of the several streams of flour produced in an ordinary roller mill, together with the loaf volume and texture score of bread prepared from the several flours.

The streams varied substantially in gluten quality, middling flours rating highest and break flours lowest. The quality factor showed no positive correlation with either the loaf volume or the texture. To correct for variations in the quantity of gluten in the different flour streams, the formula

$$\frac{\text{crude protein} \times \text{quality factor}}{\text{loaf volume}} = K$$

was applied. The resulting values for *K* agreed more closely than the values for quality factor. Factors responsible for slight differences in *K* are thought to be variations in the diastatic activity of the flour and variations in loaf volume with varying protein content. It is concluded that, if corrections are

made for these in the equation, the viscosimetric method may prove to be a useful means of determining the comparative quality of gluten in the streams of flour from a modern roller mill.

Carbon dioxide diffusion ratio of wheat flour doughs as a measure of fermentation period, C. H. BAILEY and A. H. JOHNSON (*Cereal Chem., 1 (1924), No. 6, pp. 293–304, figs. 3*).—This contribution from the Minnesota Experiment Station describes two methods for determining the rate of loss of carbon dioxide in fermenting bread doughs as an index of flour strength (E. S. R., 47, p. 261) and as a means of controlling the length of the fermentation period.

The first method involves two determinations, one including the expansion of the dough and the loss of CO_2 and the other only the expansion of the dough. The difference between the two is a measure of the loss of CO_2 from the dough, and when plotted against time shows the comparative rate of CO_2 loss. An elaborate apparatus for the determination is described and illustrated. In the second method, the rate of CO_2 lost is measured by means of an apparatus which is essentially a modification of the Osterhout respiration apparatus (E. S. R., 41, p. 524). In both methods the time elapsing before there is a sudden increase in the rate of loss of CO_2 from the dough is considered to be the optimum fermentation period of the flour in question.

On the gelatinization by heat of wheat and maize starch, C. L. ALSBERG and O. S. RASK (*Cereal Chem., 1 (1924), No. 3, pp. 107–116, fig. 1*).—The literature on the gelatinization temperatures of various starches is reviewed briefly, and discrepancies in results are explained on the ground of lack of uniformity in materials and methods. In the present investigation, the authors' viscosimetric method (E. S. R., 52, p. 13) was used to trace the change in viscosity of starch suspensions through temperature changes from 25 to above 90° C. The data thus obtained on suspensions of commercial corn and Marquis wheat starches of 4.5 and 5 per cent concentrations are presented in tabular form and in curves in which viscosities at intervals of 0.2 second are plotted against temperature.

These data show that up to 65° there is no significant change in the viscosities of the starch suspension. Between 65 and 68° the viscosities begin to increase. With cornstarch the increase in viscosity is quite rapid beyond 80° until it reaches its maximum at 91°. With wheat starch the most abrupt change occurs at about 90° and the maximum viscosity is reached at 95°. In neither case was there found to be a sharp transition point which might be taken as the gelatinization temperature. It is concluded that "there is therefore in all probability no definite temperature of gelatinization. If the temperature of gelatinization be defined as that at which anisotropy disappears, then it must be regarded as marking the temperature of an early stage of the gelatinization process, not the temperature at which the process is completed."

A list of 25 references to the literature is appended.

Studies on wheat flour grades.—IV, Changes in hydrogen-ion concentration and electrolytic resistance of water extracts of natural and chlorine treated flour in storage, C. H. BAILEY and A. H. JOHNSON (*Cereal Chem., 1 (1924), No. 3, pp. 133–137*).—The previous study of this series (E. S. R., 48, p. 806) has been extended to a similar comparison of natural and chlorine-treated flour after aging.

The conclusions drawn in the previous paper, that chlorine treatment increases the H-ion concentration and decreases the electrolytic resistance of water extracts of the flour, were confirmed, and the results of three series of experiments on flour stored for varying lengths of time up to 32 months

showed that prolonged storage causes an increase in the H-ion concentration of both natural and chlorine-treated flours. The effect of aging was slightly more marked in the natural than in the chlorine-treated flour, which is thought to indicate a tendency toward a constant degree of acidity for both natural and chlorine-treated flours.

Heat coagulation of milk (*Wisconsin Sta. Bul. 373 (1925), pp. 66–68*).—In studies by H. H. Sommer, analyses were made of the milk from three cows throughout their lactation periods. The work indicates that the calcium content of milk is high during the first month of the lactation period; it then drops to a lower point and remains fairly uniform until the last few months of the lactation period, when it again rises. The albumin content is also high at first, then drops and remains fairly uniform throughout the greater part of the lactation period, with a slight increase toward the close. Since high calcium content and high albumin content are both known to increase the heat coagulation of milk, and since milk has its highest calcium and albumin content at the beginning and at the end of the lactation period, it is concluded that heat coagulation of milk is most likely to occur at the time when most of the milk is either from "strippers" or from fresh cows.

A slight souring of the milk causes milk to coagulate more readily, not only because of increased acidity, but also on account of a lower citrate content, the citrates being destroyed by the bacteria during the souring process. The studies indicated that *Escherichia coli*, *Aerobacter cloacae*, *E. communior*, *Streptococcus lactis*, and *E. neapolitana* were capable of reducing the citrate content of milk from 0.2 to 0.06 per cent in a period of six hours, thus materially reducing the amount of citrate present. It is not believed, however, that these reactions are ordinarily of much practical importance in the heat coagulation of milk.

Methylene blue reduction test standards (*Wisconsin Sta. Bul. 373 (1925), pp. 71, 72*).—Tests indicated that there is great variation in the methylene blue from different sources, and that the solutions sold for use in the test likewise vary greatly in strength. The tablets prepared by an American firm at the suggestion of the American Public Health Association were found sufficiently uniform for practical purposes, and the adoption of the present American tablet was therefore recommended.

The chemistry of the blood in clinical medicine, O. I. V. DE WESSELOW (*London: Ernest Benn, Ltd., 1924, pp. 255, figs. 12*).—In this authoritative reference book for clinicians on the chemistry of the blood, the chemical composition of normal blood is first considered. The three pathological conditions which, in the opinion of the author, involve the most significant changes in the composition of the blood are next dealt with in considerable detail. These are diabetes and glycosuria, renal disease, and conditions of acidosis or alkalosis. Other conditions in which blood chemistry plays a significant part, although not absolutely essential for diagnosis, are treated more briefly. These include tetany, rickets, gout, hydremia and anhydremia, lipemia, anoxemia, and miscellaneous pathological conditions. The final chapter consists of directions, with references to the original literature, for the accepted methods of blood analysis. Lists of recent papers on each subject are given at the end of each chapter.

Cane sugar and its manufacture, H. C. P. GEERLIGS (*London: Norman Rodger, 1924, 2. ed., rev., pp. IX+342*).—The subject matter in this treatise on the chemistry and manufacture of cane sugar (E. S. R., 22, p. 312) has been brought up to date, the most extensive changes occurring in the sections on juice extraction, clarification, filtration, and preservation of sugar and molasses.

A gaseous fermentation of tomato pulp and related products, F. L. MICKLE and R. S. BREED (*New York State Sta. Tech. Bul. 110 (1925), pp. 3–27*).—This is a complete report of the tomato products investigation previously noted (E. S. R., 52, p. 503).

The organism responsible for gaseous fermentation sometimes occurring in tomato catsup and related products has been named *Lactobacillus lycopersici*. The media found most satisfactory for its isolation and growth were broth and agar containing about 10 per cent of tomato juice or pulp and adjusted to pH 6.8 to 7.2 before sterilizing. The organism is described as occurring in long, slender, nonspore-forming rods and filaments, Gram-positive, and nonmotile. It does not grow well on media not containing tomato. On suitable media it grows anaerobically at temperatures between 25 and 40° C. (77 to 104° F.). It is destroyed by heating to 170° F. for 2 minutes or 150° for 5 minutes. It forms acid in broth containing maltose, lactose, sucrose, raffinose, levulose, galactose, dextrose, arabinose, and xylose. It is markedly acid-resistant, and produces gas in tomato juice or tomato products unless inhibited by cold temperatures or by acetic acid, sodium benzoate, or like substances. The spoilage is accompanied by no noticeable change in the flavor, odor, or appearance of the product.

As a means of preventing spoilage, pasteurization of the catsup in bulk in steam-jacketed tanks or kettles as the catsup enters the bottles is recommended as being cheaper and more satisfactory than pasteurization in the bottle. If pasteurization in the bottle after capping is preferred, the temperature should always be 170° or higher and the time used sufficient to bring the temperature up to at least 170° and to maintain it at this temperature for 4 minutes. In refrigeration the addition of 0.2 per cent benzoate of soda or 1.5 per cent acidity has been found to delay but not entirely prevent this form of spoilage.

Dictionary of textiles, L. HARMUTH (*New York: Fairchild Pub. Co., 1924, 3. ed., enl., pp. 222*).—This dictionary includes terms and definitions referring to textiles and to the various materials used in the manufacturing and finishing processes. Under cotton a description is given of the fiber and its chemical properties, with a classification of commercial varieties and grades. Silk is discussed from the standpoint of preparation, chemical properties, classification, and history of the development of the silk industry. The information on wool includes physical and chemical properties of the fiber, classification of domestic, English, and other foreign wools, shrinkage tables for American and the more important foreign wools, the equivalents of American and international terms in spinning counts, and an explanation of international standard wool terms.

Cotton-cellulose: Its chemistry and technology, A. J. HALL (*London: Ernest Benn, Ltd., 1924, pp. 228, pls. 11, figs. 58*).—The scope of this volume on the chemistry and technology of cotton cellulose is indicated by the chapter headings, which are as follows: Cotton and cellulose, raw cotton and its purification, cotton and alkalies, cotton and acids, cotton and various reagents, cellulose and oxidizing agents, cellulose and dyes, the constitution of cellulose, cellulose and its technically important modifications, and selected methods of analysis. The usefulness of the volume is increased by tabulations of data and many illustrations.

METEOROLOGY

The problem of seasonal forecasting, C. L. ROBERTSON (*Rhodesia Sci. Assoc. Proc., 22 (1923–24), pp. 28, figs. 15; abs. in Nature* [*London*], *115* (*1925*),

No. 2885, pp. 245, 246).—It is stated that little real advance has been made in seasonal forecasting in Temperate Zone countries where the climate is subject to many very variable factors, but the outlook for such forecasting is more promising for countries such as Rhodesia where the rainfall conditions are simpler and subject to major centers of control. Even in the latter case, however, the best that can be hoped for is to reduce the possible error of the forecast to within appreciable limits by the examination of as many factors as possible. The paper discusses three methods of attacking the problem, (1) method of cycles, (2) analysis of mean rainfall curve in periodic curves, and (3) the correlation method.

No simple relation was shown to exist between sun spots and rainfall in Rhodesia during the comparatively short period for which rainfall data are available. It appears, however, that the mean rainfall is subject to fairly regular alternations of wet and dry periods of years, and that severe droughts generally "occur within a year or two of the extremes of sun spot minima and heavy rains within a year or two of sun spot maxima."

While no single cycle appears to be competent to explain the vagaries of the fluctuations in the mean annual rainfall, the 19-year cycle up to date would have been helpful in determining the years of extreme drought. The 8-year, 9.5-year and 11.1-year cycles, and probably others might also be helpful in forecasting. One element of uncertainty, however, attached to the use of cycles is the fact that their periods are not always necessarily constant.

Some connection is traced between the southwest monsoon rainfall in India and rainfall along the east coast of Africa down to Rhodesia, and the possible influence of the weather of Antarctica is referred to. Seasonal forecasts based upon the above considerations are being attempted.

Sunspots and temperatures, 1916, A. H. WALLIS (*Kimberley, Union of So. Africa: [Author], 1924, pp. 16, pls. 9; rev. in Nature [London], 115 (1925), No. 2882, pp. 135, 136*).—On the basis of observations at several stations in inland Africa during 1916, the author concludes that "sudden rises of sun-spot numbers have preceded rises in temperature in periods up to several days beforehand." The review in *Nature* questions the adequacy of one year's data for drawing conclusions on this subject.

Meteorological observations, 1922–23 (*Guam Sta. Rpt. 1923, p. 12*).—A table is given which shows the monthly temperature, pressure, precipitation, and prevailing direction of the wind at the Guam Experiment Station for the year ended June 30, 1923. The precipitation for the year was 104.54 in. "The outstanding meteorological event of the year was the typhoon of March 27, 1923, which . . . did considerable damage to buildings, livestock, and growing crops in all parts of the island and especially at the station."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, J. BOWER, JR., and E. H. WHEELER (*Massachusetts Sta. Met. Buls. 437–438 (1925), pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1925. The data are briefly discussed in general notes on the weather of each month.

The rainfall of 1924 (*Met. Mag. [London], 59 (1925), No. 708, pp. 291–293; abs. in Nature [London], 115 (1925), No. 2884, p. 204*).—A brief general summary is given which shows that over the British Isles as a whole the year was unusually wet, the average rainfall being 48.5 in., which is 117 per cent of the normal. There were, however, in parts of Scotland and the north of England fairly large areas where the rainfall was deficient. January, May,

September, and December were very wet, but February and March were unusually dry.

Loss of [rubber] crop by rain during the wet months, H. Ashplant (*Planters' Chron., 20 (1925), No. 11, pp. 167–183*).—Data for rainfall at the Mooply Experimental (Rubber) Station in south India during five years, 1920–1924, are reported, and attention is called to the losses of rubber due to the excessive monsoon rains during the harvesting period from May to September, inclusive, which reduced a potential yield of 142 lbs. per acre to 82 lbs. Comparative tests of protective devices, namely, rope gutters and aluminum shields, showed a saving during the season of 1924 of about 12 lbs. per acre by the use of the former and about 13 lbs. by the use of the latter. The gutter devices were of little use during heavy driving rains, and all of the devices were less efficient than they might have been because of their frequent disadjustment.

SOILS—FERTILIZERS

[Soil studies at the Missouri Station], M. F. Miller et al. (*Missouri Sta. Bul. 228 (1925), pp. 76–79, 80–84, figs. 5*).—These studies for the most part continue work previously noted (E. S. R., 51, p. 719).

Flocculation studies by R. Bradfield on the colloidal fraction of acid, heavy clay subsoils showed that when acid or neutral salts were used as flocculants, the minimum electrolyte requirement increased only slightly when the concentration of the clay suspension was increased, but that when alkaline flocculants were used this increase was almost directly proportional to the concentration of the clay suspension. These results are taken to indicate that neutral or acid salts are much more efficient flocculating agents than alkaline salts. In the case of neutral clays, the differences in the efficiencies of the neutral and alkaline electrolytes were not so marked as with acid clays.

Studies on the effect of the H-ion concentration on the absorption and exchange of bases by colloidal clay showed that treatments which lowered the Sorensen value of the clay caused the liberation of more equivalents of total bases than were absorbed. Treatments which were isohydric with the clay caused equivalent exchange, while those which raised the pH value of the clay caused the absorption of more equivalents of bases than were liberated. Gypsum tended to decrease slightly the pH value of the acid soils and consequently caused an approximately equivalent exchange of bases, while calcium oxide or calcium carbonate did not liberate an appreciable amount of bases until after the acidity of the soil was neutralized.

Studies by Miller and F. L. Duley on the rate of accumulation and cost of nitrogen and carbon in soils under different systems of green manuring and cropping showed measurable increases in nitrogen from treatment such as turning under rye, cowpeas, and red clover. No measurable increases in nitrogen were recorded where crops of corn, wheat, and clover in rotation were removed and where red clover had been grown regularly. The effect of plowing under a cowpea crop and a rye crop the same season, as compared with plowing under a rye crop alone, showed very little difference in the yield of rye, although the cowpea crop had an important physical effect upon the soil. The alternate freezing and thawing in the spring produced a much more honeycombed structure where both rye and peas were plowed under than where only the rye was plowed under.

Studies by W. A. Albrecht of nitrate production in a soil as affected by crop and cultivation emphasized the close relationship of nitrate production in the

soil to the crop and soil treatment, the crop being so important in nitrate removal that the general nitrate content in the soil during the season was almost a reciprocal of the crop growth. Early spring and early fall plowing increased nitrogen accumulation, while late fall plowing allowed little accumulation. A soil mulch under fallow resulted in a slight average increase in nitrogen accumulation in the surface soil, while a straw mulch markedly inhibited nitrification. No causal connection of temperature with the rate of nitrate accumulation was found.

Studies on the effects of different long continued soil treatments upon bacterial activity in the soil again emphasized the low nitrate production in soils continuously cropped without organic matter or fertilizer addition, even though limestone was added. When manure was added the nitrate accumulations were higher even when the soils were not limed, indicating that manuring lessened the injurious effect of acidity on nitrification. Soils fertilized with chemical fertilizers showed a nitrate accumulation practically equal to that in soils receiving manure, and almost equivalent to that in soils on which both manure and lime were added.

A continuation of the studies by Albrecht of *Bacillus radicicola* in the soil, begun in 1917, showed that during the last test, in the spring of 1924, the bacteria were no longer viable in the soil stored in the dry condition. All 8 of the dried and stored samples grown to red clover failed to inoculate the crop, while 7 of the 8 grown to soy beans failed to inoculate. These results are taken to indicate that these bacteria can not live in dry soils longer than 6 years. The soils left out doors gave good inoculation in all cases, there being little difference in the length of persistence by the living organism whether the soil was dried in the sunlight or in the dark, whether it was fertilized or unfertilized, or whether it was fairly high or low in organic matter. The soil stored outdoors still produced nodules profusely 6.5 years after crop removal.

Studies by Duley on the calcium content of soils and its relation to acidity and the response of soils to liming indicated that the results obtained from the use of lime in the field can be much more readily explained upon the basis of the amount of soluble calcium than by a determination of soil acidity. Soils that showed less than 700 lbs. of soluble calcium in the top 7 in. gave good returns from the use of lime in the fields, while those that showed decidedly more than this amount were not only greatly benefited from further applications of lime, but for the most part were soils that produced clover or alfalfa without the use of liming materials.

[Soil studies at the Wisconsin Station] (*Wisconsin Sta. Bul. 373 (1925), pp. 41–51, figs. 6*).—In studies of the water-holding capacity of soils by H. W. Stewart, with particular reference to its effect upon crop production, it has been found that medium sand supplies a crop with more moisture from light rains and showers than does fine sand or sandy loam, if the rain comes at a time when the moisture content of the soil is low. On the other hand, the greater water-holding capacity of sandy loam has enabled it to produce considerably the largest yields. These results are said to corroborate those of previous experiments in showing that rye is the small grain crop best adapted to these sandy soils. The yields of soy beans on medium and fine sand were practically the same as those from sandy loam, indicating that the sands supply moisture to soy beans nearly as well as the sandy loam.

Experimental work by A. R. Whitson and R. P. Bartholomew is said to have indicated that the decomposition of manure in the soil, and the consequent liberation of carbon dioxide, aids in rendering the soil potash available to crops. In greenhouse studies, in which certain crops were grown in pure quartz and in subsoil, it was found that in sand or in subsoil which had been

treated with a good quality of stable manure, the addition of both nitrogen and phosphorus yielded marked increases over the manure alone, indicating that the potash content of the manure was sufficient to permit more growth than was provided for by the nitrogen and phosphorus contents.

Data on the use of phosphates, the fertilization of peat soils, and general fertilizer experiments are included. Attention is also drawn to experiments indicating that aluminum is a factor in acid soil toxicity.

Field experiments by E. Truog and O. J. Noer on the use of activated sludge as a fertilizer indicated that this material ranks high when compared with other organic nitrogenous materials which are used in the preparation of commercial fertilizers.

Necessity of an evolution in chemical analyses of arable soils [trans. title], MARCHADIER and GOUJON (*Ann. Sci. Agron. Franç. et Etrang.*, *42* (*1925*), *No. 1, pp. 32–64*).—By means of studies of 16 soils, the importance is brought out of considering all of the elements in the soil as well as its reaction in order to make chemical analyses of the most value.

The chemical composition of the soils of the Chatsworth area in New Jersey, A. W. BLAIR and A. L. PRINCE (*New Jersey Stas. Bul. 414* (*1925*), *pp. 15, figs. 2*).—Partial analyses of 65 samples of soil taken from the Chatsworth area lying wholly within the Coastal Plain in New Jersey are presented and discussed. The majority of the soils are sands or sandy loams, and the analyses indicate that they contain a low percentage of plant nutrients, with the exception of the Collington series, which contains a rather high percentage of phosphoric acid and potash but is deficient in organic matter.

Soil survey of Benton County, Iowa, C. LOUNSBURY ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1221–1250, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 455,680 acres forming part of a drift-covered prairie plain in east-central Iowa. The topographic features are those of a relatively smooth prairie plain, which is eroded and somewhat rugged and forested along the larger streams. Drainage is said to be fairly well established.

The soils are for the most part dark-colored prairie soils with a small extent of light-colored forest soils. Including peat and meadow, 28 soil types of 15 series are mapped, of which the Tama and Carrington silt loams cover 48.4 and 11.8 per cent of the area, respectively.

Soil survey of Des Moines County, Iowa, T. H. BENTON and E. P. LOWE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1091–1126, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 261,760 acres in southeastern Iowa. The county has two principal types of topography, namely, rolling upland and the flat alluvial terraces and flood plains. The county lies wholly within the Mississippi River drainage basin.

The soils are grouped as the dark-colored soils of the prairie and alluvial lands and the light-colored soils of the forested upland slopes. Including riverwash, 27 soil types of 17 series are mapped of which the Grundy, Clinton, and Lindley silt loams cover 31.1, 21.6, and 11.4 per cent of the area, respectively.

Soil survey of Jasper County, Iowa, D. S. GRAY ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1127–1168, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 467,200 acres in central Iowa. In general the surface of the county is gently rolling to rolling, with some flat areas on divides, and strongly rolling to broken regions bordering the larger streams.

The areas of alluvial soils are mainly flat. Natural drainage as a whole is said to be very good.

The soils are divided into dark-colored and light-colored soils, or those developed under a grass vegetation and those developed under a forest growth. Including peat and muck, 33 soil types of 18 series are mapped, of which the Tama and Clinton silt loams and the Carrington loam cover 42.3, 12.8, and 10.1 per cent of the area, respectively.

Soil survey of Allegany County, Maryland, O. C. BRUCE and A. M. SMITH (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1063–1090, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey and the Maryland Experiment Station, deals with the soils of an area of 264,960 acres lying in the Appalachian region of western Maryland. The topography is strongly rolling to mountainous, and natural drainage is on the whole well developed, in many cases being so rapid as to cause harmful erosion in cultivated fields.

The soils of the county range in color from gray to brown in the surface soil and from yellow to brownish yellow in the subsoil. Including rough stony land, 18 soil types of 9 series are mapped, of which Dekalb shale loam, Dekalb stony silt loam, and Dekalb stony loam cover 26.7, 12.9, and 11.2 per cent of the area, respectively. The results of 3-year fertilizer tests with potatoes, oats, and clover on Dekalb gravelly loam are also briefly summarized.

Soil survey of Wicomico County, Maryland, J. M. SNYDER and R. L. GILLETT (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1011–1038, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey and the Maryland Experiment Station, deals with the soils of an area of 241,920 acres in the southern part of the Eastern Shore of Maryland lying in the Coastal Plain province. The topography is flat to gently rolling, and the drainage is fairly well established.

The soils of the county are prevailingly light colored. Including tidal marsh, swamp, and meadow, 18 soil types of 6 series are mapped, of which the Sassafras series is the most extensive.

Soil survey of McHenry County, North Dakota, E. W. KNOBEL ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. IV+929–973, pls. 6, fig. 1, maps 2*).—This survey, made in cooperation with the North Dakota Experiment Station, deals with the soils of an area of 1,208,320 acres lying within the glaciated part of the Great Plains in north-central North Dakota. It includes two topographic divisions, namely, the drift plain, which embraces part of the bed of Lake Souris, and the Missouri Plateau. That part of the drift plain which was temporarily covered by Lake Souris has a gently undulating topography, the remainder of the drift plain being undulating to hilly. The Missouri Plateau is gently undulating except where it carries the more rolling Altamont moraine. The county is drained by the Souris River and its tributaries, and a considerable part of the run-off drains into potholes, depressions, and lakes.

The soils of the county are developed on glacial drift, glacial lake deposits, river terraces, and flood plains. Including dunesand, intermittent lakes, and peat and muck, 34 soil types of 10 series are mapped, of which the Barnes loam covers 30.4 per cent of the area.

Alkali soils in Montana, E. BURKE and R. M. PINCKNEY (*Montana Sta. Bul. 172 (1925), pp. 20, fig. 1*).—Data on the location, origin, extent, and composition of the alkali soils of Montana are presented and discussed. It is stated that white alkali is found in the soil of some of the irrigated districts in sufficient quantities to prohibit plant growth. The combined influence of alkali content and deficiency of organic matter is said to be mainly responsible for the non-

productiveness of such soils. Black alkali is not so prevalent as white alkali, and in exceptional cases only is it found in sufficient quantities to prohibit plant growth. The occurrence of nitrates, known as niter spots, is said to be most common in the irrigated sections.

Treatment of black alkali with gypsum, C. N. Catlin and A. E. Vinson (*Arizona Sta. Bul. 102 (1925), pp. 289–337, figs. 22*).—Studies of black alkali soils are reported which showed that sodium carbonate resists leaching tenaciously and can be removed from the soil successfully only after neutralization. The percolation of water through the University Farm soil was found to be accelerated by gypsum treatment, the acceleration increasing with the amount of gypsum applied up to double that necessary to neutralize the black alkali present. The details of the reclamation of black alkali soils are outlined.

A study of the biological activities in certain acid soils, W. V. Halversen (*Oregon Sta. Bul. 211 (1925), pp. 4–26, figs. 5*).—Studies of the relation of lime to the production of plant nutrients in certain prominent soil series of the Willamette Valley in Oregon are reported.

The microflora of these soils under greenhouse conditions were found to respond to the application of lime. The ammonifying power was little affected by liming, but the nitrifying power was greatly stimulated. The results as a whole are taken to indicate that lime has a stimulating effect on those forces that operate in the production of plant nutrients in the soils studied.

Carbon dioxide formation in soil [trans. title], O. Lemmermann and H. Wiessmann (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 6, Wiss., pp. 387–395, figs. 2*).—Studies on the decomposition of straw, lupines, and horse manure in soils and of the soil organic matter, with particular reference to carbon dioxide production, are reported.

It was found that during a period of 995 days the decomposition of straw in soil resulted in the greatest carbon dioxide production, followed by the lupines and horse manure. The production of carbon dioxide did not cease during the period, and was continuously more inteusive in the soils receiving the straw and horse manure than in the plain soils.

The results are taken to indicate that carbon dioxide development in soil, whether treated with organic matter or not, does not proceed in accordance with the growth law of bacteria. It was further found that the formation of carbon dioxide is slower than a process of the first order. Under aerobic and constant conditions it proceeded in accordance with the equation $x=a\,k\,t^m$, in which x is the quantity of carbon dioxide produced in the time t, a is the initial carbon content of the soil, and k and m are constants.

Humus in Brazilian coffee soils [trans. title], M. Piettre (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 2, pp. 139–141*).—Studies are reported which showed that the mineral fertilizing elements in virgin soils rise from the subsoil and become mixed with the humus of the surface soil. The humus has been found to favor the fixation of these nutrients in a form available to the crop.

Some properties of loess [trans. title], V. Agafonoff (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 1, pp. 103–105*).—Data on the physical, chemical, and mineralogical composition of loess from different countries are briefly discussed in an effort to explain its tubular formation. It is concluded that these formations are due more to wind action than to any other influence.

Kaolins, clays, etc., colloidal plasticity, and phenomena of the gel and sol [trans. title], A. Bigot (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 1, pp. 88–90*).—The results of the treatment of 18 different kaolins and clays with 14 different reagents are reported in tabular form, showing the influence of such treatment on gel or sol formation.

Studies of capillary rise in soils [trans. title], C.-V. GAROLA (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 1, pp. 1–31, figs. 17*).—A theoretical discussion of the subject is followed by a report of experimental determinations of the capillary rise in sand soil, very fine sandy silt, silt, clay humus silt, and flinty clay.

The velocity of capillary rise of water in these materials appeared to be regulated by the fineness of the particles, or, in effect, by the percentage of clay. Capillary absorption proceeded in a manner analogous to that of capillary rise. As the soils varied from pure silt to clay, the action of the clay content depressed permeability and capillary absorption from 0 to 18 per cent.

Certain relationships between added salts and the moisture of soils, L. C. WHEETING (*Soil Sci., 19 (1925), No. 4, pp. 287–299*).—Studies conducted at the Michigan Experiment Station on the mutual effects of salts and moisture added to soils of different textures are reported. No salt movements were observed in soils containing only hygroscopic moisture. Increasing the moisture content increased the rate and amount of salt translocation up to a certain point, after which further additions of water showed no increasing effects. The point of maximum salt movement occurred in medium sand at a moisture content of about 3 per cent and in silt loam at about 10 per cent.

An undissolved salt such as sodium carbonate had a strong attraction for soil moisture. This force was stronger than the force of capillarity. There was a marked and important movement of soil moisture as a vapor toward a salt-treated soil. Where capillary connection was cut off, this caused an accumulation of water around the salt. It is thought that the vapor movement of moisture in soils is undoubtedly important.

Modification of vegetable soils by air drying [trans. title], A. LEBEDIANTZEFF (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 11, pp. 960–963*).—In further studies on the subject (E. S. R., 51, p. 415), air drying of vegetable soils was found to result in bacteriological and chemical phenomena similar to those produced by partial sterilization. Studies to determine the influence of the different factors acting on the soil during air drying, such as oxygen, loss of moisture, heating by the sun, and light, showed that while the oxygen and light have no positive action, loss of moisture and heating by the sun are clearly quite effective. In fact, the increased fertility of soils resulting from air drying is attributed primarily to the chemical and biological transformation brought about by loss of moisture and heating.

Increase of fertility by air drying of soil under natural conditions [trans. title], A. LEBEDIANTZEFF (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 13, pp. 1091, 1092*).—Further experiments in the field showed that temporary drying of the surface soil resulted in an increase in fertility similar to that observed in the previous laboratory experiments noted above.

[Cultivation studies at the California Station] (*California Sta. Rpt. 1924, p. 47*).—It is reported that under California conditions cultivation is of negligible value in conserving moisture in the soil except as such cultivation eliminates weed growth, and that in the absence of a free water table the movement of moisture in the soil under the influence of capillarity is too slow to be of appreciable benefit in distributing moisture in the soil to growing plants.

Green manure and soil-building crops for Arizona, G. E. THOMPSON, R. S. HAWKINS, and S. P. CLARK (*Arizona Sta. Bul. 104 (1925), pp. 353–379, figs. 8*).—Leguminous crops of value as green manures in Arizona are described and discussed.

[Soil fertility studies by the Indiana Station at Moses Fell Annex Farm], H. J. REED and E. W. MOORE (*Indiana Sta. Circ. 123 (1925), pp. 2–6, fig. 1*).—

Data on the relative values of acid phosphate, rock phosphate, bone meal, and basic slag in different proportions and with various other fertilizing materials are presented.

The results of some fertility experiments on Oklahoma soils, H. F. Murphy (*Oklahoma Sta. Bul. 155* [*1925*], *pp. 34, fig. 1*).—The results of six different fertility experiments on typical Oklahoma soils are presented in detail.

These indicate in general that the use of a crop rotation is essential for the production of high yields, and that the only commercial fertilizer that has more than paid for its cost is acid phosphate. Lime has not paid except for alfalfa, but crop residues have been valuable in maintaining crop yields. The necessity for the more efficient use of barnyard manure is emphasized.

Determination of fertilizer requirements of soil [trans. title], J. König and J. Hasenbäumer (*Ztschr. Pflanzenernähr. u. Düngung, 3* (*1924*), *No. 12, Wirtschaft.-Prakt., pp. 497–532*).—Laboratory and field studies are reported, the results of which are taken to indicate the value of a 1 per cent citric acid solution for determining the availability of the major plant nutrients in soils. It is concluded that, if 1 kg. of a soil contains from 140 to 150 mg. of nitrogen, 250 mg. of phosphoric acid, and 160 mg. of potash soluble in 1 per cent citric acid solution, no additional amounts of these materials are necessary for most crops.

The use of fertilizers on Iowa soils, W. H. Stevenson and P. E. Brown (*Iowa Sta. Circ. 97* (*1925*), *pp. 16, fig. 1*).—Practical information is presented.

Absorption of potash by humic acid [trans. title], A. Charriou (*Compt. Rend. Acad. Sci.* [*Paris*], *179* (*1924*), *No. 3, pp. 206–209; abs. in Ann. Sci. Agron. Franç. et Étrang., 42* (*1925*), *No. 1, p. 68*).—Studies are reported which indicated that the fixation of potassium from caustic potash solution by humic acid is more an absorption than a chemical combination. This absorption was greater than that from potassium carbonate or bicarbonate. The absorption from potassium chloride was even less, but when calcium carbonate was present it was considerably increased. It was found further that potassium absorbed by humic acid can be displaced by calcium. Similar results were obtained with salts of barium, magnesium, and iron.

Analyses of commercial fertilizers, H. E. Curtis, H. R. Allen, and L. Gault (*Kentucky Sta. Bul. 251* (*1923*), *pp. 371–485*).—Guaranties and actual analyses of 750 samples of fertilizers and fertilizer materials collected for inspection in Kentucky during 1923 are presented.

Inspection of fertilizers, J. B. Smith and W. L. Adams (*Rhode Island Sta. Ann. Fert. Circ., 1924, pp. 12*).—Guaranties and actual analyses of 88 fertilizers and fertilizer materials, limes, and ashes collected for inspection in Rhode Island during 1924 are presented.

AGRICULTURAL BOTANY

Methods in plant histology, C. J. Chamberlain (*Chicago: Univ. Chicago Press, 1924, 4. rev. ed., pp. XI+349, figs. 118*).—In this, the fourth edition of the book previously noted (E. S. R., 34, p. 727), directions for collecting materials have been amplified, preparations of the most familiar laboratory types have received particular attention, methods and processes have been improved, and stains have been rendered more effective.

Plant nutrition [studies] (*California Sta. Rpt. 1924, pp. 48, 49*).—Among the results of investigations briefly reported it is shown that by the displacement method solutions may be obtained from soils which approximate very closely the soil solution from which plants obtain essential elements. Prelimi-

nary experiments with a new method of injecting chemical substances into trees are said to indicate that this method offers great possibilities in overcoming chlorosis, and also in protecting trees against certain plant diseases.

Physical and chemical factors in the growth of asparagus, E. B. WORKING (*Arizona Sta. Tech. Bul. 5 (1924), pp. 87–124, figs. 14*).—The investigations reported were undertaken as a study of the physicochemical basis of plant growth. The asparagus plant was selected on account of the large volume of growth and its tolerance to mechanical injury. In general, the elongation of the shoots was taken as a measurement of growth.

Light was found to have little immediate effect on shoot growth, but it was an imporant factor in the production of new roots, possibly as a result of a change in the carbohydrate gradient due to photosynthesis. The three external factors of greatest importance in the growth rate of the shoot were temperature, moisture content of the soil, and salt balance of the soil. Increase of growth rate was always found with increasing temperatures up to the highest which occurred during the experiments. Temperature was not found to be a limiting factor in the narrowest sense of the word, as an improvement in the salt balance of the soil induced more rapid growth at the same temperatures. The height of stalk before branching was found to be governed chiefly by the temperature. The addition of sodium salts in medium or low concentration improved the salt balance of the soils and nutrients used.

Development of starch grains in potato tubers [*trans. title*], L. LINDET and P. NOTTIN (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 3, pp. 149–155*).—From work indicated briefly, conclusions are drawn and presented here in considerable detail.

No disagreement is shown with the view of Dangeard, whose work is cited (E. S. R., 45, p. 30; 46, p. 724; 50, p. 427), but no confirmation was obtained regarding the statements of Courtonne (E. S. R., 47, p. 128) as to the probable presence of starch in soluble form, capable of passing through cell walls, in so far as the precipitation of such starch was concerned.

Carbohydrate storage in the endosperm of sweet corn, L. LAMPE and M. T. MEYERS (*Science, 61 (1925), No. 1576, pp. 290, 291*).—A preliminary report is given of the study of carbohydrate storage in the immature endosperm of sweet and waxy sweet corn. The authors found in the endosperm globules of cytoplasmic origin that stain red with iodine, and within these globules as they increased in size there were usually smaller grains of solid carbohydrate. The nature of this carbohydrate has not been definitely determined, though facts cited support the view that it is a dextrin and that it is closely related to starch. The liquid portion of the globules apparently also is a dextrin, but nearer to sugar than are the grains of carbohydrate which stain red. About one-half of the polysaccharide content of the endosperm of sweet corn is in the form of globules, except in pseudostarchy corn in which there are fewer globules. It has not been possible to isolate the globules from mature kernels of sweet corn.

The kind of carbohydrate stored in the cell is governed by the genetic complex of the kernel. The development of the grains and of the globules in sweet corn apparently proceeds in a definite, orderly course up to the maturation of the endosperm. There is no evidence from these studies of a reversal of these processes or of any hydrolysis of the carbohydrate grains after they are formed.

On the upper critical concentration of oxygen in root growth, W. A. CANNON (*Science, 61 (1925), No. 1570, pp. 118–120*).—A discussion is given of some of the apparent characteristics of the upper critical concentration of oxygen in root growth, and attention is called to the absence of experimental work

correlating field studies and laboratory investigations on oxygen supplies and requirements.

Plasmolysis and permeability [trans. title], S. PRÁT (*Biochem. Ztschr., 128 (1922), No. 4–6, pp. 557–567, figs. 6*).—The degree of plasmolysis increases after a certain time in solutions having monovalent ions but remains constant or decreases in those having bivalent ions, the change being more marked for cations than for anions. Probable underlying facts are discussed. Premortal rise of permeability was not detected plasmolytically.

Plasmolysis and permeability, II, S. PRÁT (*Preslia (Bul. Soc. Bot. Tchécoslov. Prague), No. 2 (1922), pp. 90–97, figs. 4*).—A continuation in English of the report above noted adds to the bibliography therein given. Höfler's plasmometric method of determining osmotic pressure and permeability is said to be applicable also in cells of irregular form (Mnium). Aniline dilute solutions cause accelerated penetration by methylene blue, neutral red, $FeSO_4$, and $NaHNH_4PO_4$ in cells of Spirogyra. The plasmometric method indicates a decrease of permeability of Spirogyra for KCl and NaCl after the action of diluted aniline solutions.

Variations in diastatic power of urease [trans. title], A. VOSKRESSENSKY (*Compt. Rend. Soc. Biol. [Paris], 88 (1923), No. 7, pp. 498–500*).—The author has pursued work, related to that reported by Dox (E. S. R., 43, p. 610), on variations in diastatic activity of urease obtained from *Soja hispida* seeds of different ages. The results as tabulated show variations and other features which are discussed.

Vitality of leaves of Aucuba in vacuo [trans. title], P. A. and P. DANGEARD (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 2, pp. 49–53*).—The authors have carried forward the work of Maquenne and Demoussy (E. S. R., 50, pp. 126, 327), using for purposes of comparison one of the leaves employed by those authors in connection with other leaves of Aucuba detached in early summer and kept for about five months in an illuminated vacuum.

The leaves remained wholly alive, as was proved by observations of cellular movement and by the persistence of the capability to take "vital" coloration, no differences being discernible between these leaves and those remaining on the trees at the end of the period of experimentation.

Second note on the vitality of leaves of Aucuba in vacuo [trans. title], P. A. and P. DANGEARD (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 26, pp. 1855, 1856*).—At the end of May, 1923, a second vacuum tube containing leaves of Aucuba was opened, this tube having been closed just one year previously in the course of work by Maquenne and Demoussy, part of which had been recorded as carried forward by the present authors in the report above noted. Although the other leaves which had been left attached had dropped and died, the leaf which had spent a year in a sealed and exhausted tube showed no appreciable decline or even change within the last six months of the test, as compared with that of the previously described experiment. In no respect had the leaf suffered perceptible loss, or injury, or decrease of functioning power during this time. Apparently it is not necessary to such results even that the leaf be entire.

Carbon dioxide in soil gases, J. N. MUKERJEE (*Agr. Jour. India, 19 (1924), No. 2, pp. 146–154, figs. 2*).—Studies indicated show that stunting of orchard trees on grassed plats is referable to the relatively large increase of carbon dioxide percentage in the soil gas content, especially in the layer not deeper than 18 in. and particularly during and after the monsoon period. It appears that in the grassed plats a large proportion of the grass roots die during the hot weather. During the monsoon, conditions are favorable to rapid decomposi-

tion of the organic detritus introduced into the soil from the roots of the grass, carbon dioxide being one of such products of decomposition.

Stimulation of spore germination by CO_2, L. W. Durrell (*Science*, *60* (*1924*), *No. 1561*, *p. 499*).—The author reports difficulty in securing the germination of spores of *Basisporium gallarum* in water drop cultures, but abundant germination took place in the presence of plant tissues even when not in contact with them. This suggested carbon dioxide as the stimulating agent. Subsequent studies with carbon dioxide liberated from plant tissues, and direct applications of the gas, showed decided stimulation of the spores of the fungus.

Nuclear degeneration in wood of conifers [trans. title], O. Vodrážka (*Preslia* (*Bul. Soc. Bot. Tchécoslov. Prague*), *No. 2* (*1922*), *148–156*, *figs. 15*).—Brief presentation is made of studies on nuclear degeneration observed during the formation of tracheids in *Picea excelsa* and *Pinus laricio*.

On a photo-growth reaction without phototropical curvation [trans. title], V. Úlehla and V. Morávek (*Preslia* (*Bul. Soc. Bot. Tchécoslov. Prague*), *No. 2* (*1922*), *pp. 117–140*, *figs. 3*).—The apical cells of *Basidiobolus ranarum* do not react to instantaneous weak illumination, but they give, if strongly illuminated, the typical light response growth reaction first described by Blaauw (E. S. R., 42, p. 128). This light growth reaction in Basidiobolus is positive up to a certain intensity, but above that negative. A change in the form of the hyphal apex goes on simultaneously, and this is called here a photo-form-reaction, of which two forms are described.

Basidiobolus shows the light growth reaction, but does not bend toward or from a unilateral illumination, and hence is regarded as not phototropic. Under continued unilateral illumination, associated with straight growth, it is stated that light growth and light form-reaction become more complicated, and it is thought that there may be several superimposed simple reactions.

Since Basidiobolus gives the light growth reaction but is not phototropic, it is believed that Blaauw's theory is founded on fact though supposedly not true for all cases. The hypothesis is proposed that the light growth reaction is primarily a reaction of the cell membrane, the phototropic process primarily a reaction of the plasma.

The influence of drought on the regulation of stomata and on the growth of plants [trans. title], W. S. Iljin (*Preslia* (*Bul. Soc. Bot. Tchécoslov. Prague*), *No. 2* (*1922*), *pp. 43–55*).—Plants selected for the observations here detailed show no uniform weight increment. On the contrary, they may, during drought, lose weight considerably, owing to lowered anabolism and increased catabolism, associated with a loss of regulatory power by the stomatal mechanism and a lowering of activity in chlorophyllous parenchyma.

On the effect of ultraviolet rays upon nuclear divisions of plants, N. Takamine (*Bot. Mag.* [*Tokyo*], *37* (*1923*), *No. 439–444*, *pp. 109–112*, *pl. 1*).—Using as material root tips of *Vicia faba* and *Allium cepa* and pollen mother cells of *Capsella bursa pastoris*, *Lactuca thunbergiana*, and *L. lanceolata platyphylla* and exposing these from 0.5 to 3 hours to radiation from a Hereuß mercury (vapor) lamp of wave length 2,500 Ångstrom units, amperage 2.5, voltage 115, and distances 10 and 20 cm., the author found that under ultraviolet rays the structure of chromosomes gains distinctness. The chromosomes break up at that point when the rays become very intense, karyoplasmic masses being scattered irregularly in the cells exposed to the rays. Irregular distribution of chromosomes was noted, as were also, sometimes, tripolar di-

visions of somatic nuclei. In pollen formation, not all tetrad cells develop into definite grains, as some degenerate. Apparently the number of chromatin grains has no connection with the number of the chromosomes of the nucleus.

The alteration of flower color through external factors [trans. title], A. Weisse (*Verhandl. Bot. Ver. Brandenb., 65 (1923), pp. 27–36*).—The author concludes this account of the influence of external factors on flower coloration by stating that *Hydrangea hortensis* afforded the only example of alteration of flower color through change in the composition of the soil.

Pistillody of papaya ovules, D. A. Herbert (*Philippine Agr., 13 (1924), No. 3, pp. 107, 108 pl. 1*).—Pistillody, or replacement of some other plant organ by a carpel, is said not to be rare in the Philippines. Detailed descriptions are given of three such abnormal growths of papaya ovules.

Serum-diagnostic studies on relationships within the Rosales [trans. title], K. Kohz (*Bot. Arch., 3 (1923), No. 1, pp. 30–60, fig. 1*).—A study of relationships among the Rosales, attempting to utilize therein the sap composition, particularly as regards nitrogeneous materials, is presented in systematic and graphical form, with extensive references.

A taxonomic review of currants and gooseberries, A. Berger (*New York State Sta. Tech. Bul. 109 (1924) pp. 3–118, pls. 8*).—The results are given of a taxonomic study of the wild and cultivated currants and gooseberries except those belonging to the subgenera Berisia and Parilla, neither of which is considered as of interest to horticulturists of this country. The author recognizes 67 species of Ribes and 52 of Grossularia, together with numerous varieties of each. The probable origin of a large number of hybrids is indicated.

A review of the present problems and methods of agricultural bacteriology, C. Barthel (*Stockholm: P. A. Norstedt & Sons, 1923, pp. 116, figs. 42*).—This is an account of a comprehensive tour of study, in utilization of a fellowship from the Wallenberg Foundation awarded in January, 1922, to the author under the sanction of the Royal Agricultural Academy of Sweden. The studies were carried out in England, France, and Switzerland and more at length and in detail in the United States, this country being credited in the report with very rapid recent development of intensified research. An account is included of the latest results of research in agricultural bacteriology in the different countries studied.

Studies of cellulose-fermenting bacteria (*Wisconsin Sta. Bul. 373 (1925), p. 73*).—Studies by E. B. Fred are said to have shown that the unfavorable or toxic action of wood on plant growth is due in large measure to reduction of the amount of nitrates in the soil. This loss of nitrate nitrogen is said to be caused by the great increase of the nitrate-assimilating bacteria which make use of cellulose. It is claimed that woods which decompose more slowly are in general toxic for a longer period of time.

A study was also made of the decomposition of cellulose with pure cultures of thermophilic bacteria, and it was found that bacteria growing at a temperature of 150° F. will attack paper pulp and all kinds of nonlignified cellulose very rapidly. The products of the fermentation of the cellulose are carbon dioxide, hydrogen, acetic acid, and ethyl alcohol.

Toxic action by saprophytic microorganisms on plants [trans. title], J. Kořínek (*Preslia (Bul. Soc. Bot. Tchécoslov. Prague), No. 2 (1922), pp. 59–66*).—Having injected the various organs of *Vicia faba* with *Bacterium prodigiosum*, the author was not able to demonstrate any toxic action as judged by growth.

GENETICS

An introduction to the study of heredity, E. W. MacBride (*New York. Henry Holt & Co.; London: Williams & Norgate, 1924, pp. 256, figs. 36*).—An elementary presentation of genetic laws and theories.

Heredity in man: Its importance both biologically and educationally, H. B. Fantham (*So. African Jour. Sci., 21 (1924), pp. 498–527, figs. 15*).—A brief review of our present knowledge of the inheritance of characters in man, with reference to the future advancement of humanity.

Potato breeding methods, F. A. Krantz (*Minnesota [Sta.] Tech. Bul. 25 (1924), pp. 3–32, figs. 5*).—The clonal selection and sexual breeding methods of obtaining improved varieties of potatoes were studied intensively. Part of the work, wherein it appeared that the method of asexual selection does not offer reasonable hope for further improvement of potato varieties, was noted earlier (E. S. R., 49, p. 333).

Seedlings of F_1 varietal crosses were more vigorous than the seedlings of the parents which were obtained by using selfed seed. The increase in vigor was expressed in both the amount of vine growth and the yield of tubers. A cross between Sir Walter Raleigh and an unnamed variety from South America (E. S. R., 49, p. 133) was carried into the F_2 generation. In this cross between a variety producing medium or small amount of viable pollen and a variety producing abundant pollen it was possible to select desirable F_1 plants producing an abundance of self-fertilized seed. This made possible the selection of desirable parents for the F_2 generation.

The characters of period of maturity and vigor in first-year seedlings, as judged by amount of vine growth and yield, were found to be correlated with their behavior the second year. The time of maturity and vigor of seedlings in their first year may be sufficiently representative of their later behavior that certain groups of seedlings can be eliminated after the first year.

Selection in self-fertilized lines was found to be a practical method of securing improved parental material. A comparison of F_1 and F_2 seedlings showed that as the seedlings became more homozygous a reduction in vigor occurred. Results in this study led to the conclusion that selection within self-fertilized lines with subsequent crossing of the inbred individuals is the most promising and the most practical method for the further improvement of potato varieties.

A handy pollen carrier, C. E. Leighty and W. J. Sando (*Jour. Heredity, 16 (1925), No. 2, pp. 63–65, figs. 2*).—An adjustable ring, which is fitted with an open cylinder for holding a gelatin capsule and a projection to fit the cap of the capsule when not in use, is worn on the index finger while pollen is being collected from a head of wheat or other plants during pollination.

[Varietal studies of Crepis capillaris] (*California Sta. Rpt. 1924, p. 46*).—A continuation of studies of *C. capillaris* (E. S. R., 52, p. 29) is said to have shown that the presence of duplicated Mendelian genes in a species is not necessarily evidence of duplication of chromosomes, for in this species no two chromosomes can be considered as duplicates, yet duplicated genes are present; that the production of chlorophyll is dependent upon both dominant and recessive genes; that the wild species is a collection of genetically mixed types which result in a number of true breeding and distinct types after a few generations of self-fertilization; that a certain locus is more subject to mutative change in a given direction than other loci; and that certain genes exhibit linkage.

Evidence of structure in the gene, D. H. THOMPSON (*Amer. Nat., 59 (1925), No. 660, pp. 91–94*).—The author presents a theoretical discussion of genes with reference to their location in the chromosomes, in which it is pointed out that the theoretical loci in Drosophila are not distributed at random throughout the length of the chromosomes but are bunched in different places. The author is of the opinion that mutations involve a mechanical alteration of the genes which is expressed by other genes located in a similar position.

Soma and germ, M. F. GUYER (*Amer. Nat., 59 (1925), No. 661, pp. 97–114*).—This is a discussion of the relation of the somatic and germ cells to each other and to environmental influences. A large portion of the paper deals with the effect of lens antibodies on the production of eye abnormalities in the rabbit. The results of further experiments are offered in defense of some of the criticisms directed toward an earlier paper (E. S. R., 44, p. 566).

Cytological investigations with speltoids and other mutant-like aberrants in wheat [trans. title], Ö. WINGE (*Hereditas, 5 (1924), No. 3, pp. 241–286, figs. 30*).—Cytological studies on the material of Lindhard (E. S. R., 51, p. 29) are reported on in detail.

Some cases of apparent single fertilization in barley, H. V. HARLAN and M. N. POPE (*Amer. Jour. Bot., 12 (1925), No. 1, pp. 50–53, pl. 1*).—Evidence of xenia was observed in Svanhals×Manchuria barley and in other hybrids. During studies on kernel development in barley there were found kernels lacking embryos and kernels deficient in endosperm content, abnormalities seeming to be connected with the question of double fertilization. An obvious hypothesis is that only a single fertilization occurred where either abnormality resulted.

The chromosome numbers of Secale cereale [trans. title], K. GOTOH (*Bot. Mag. [Tokyo], 38 (1924), No. 453, pp. 135–151, figs. 13*).—Occasional rye plants having 8 (16) chromosomes were observed among plants with the usual 7. Two homologous chromosomes in the 8-chromosome plants very often behave differently from the 14 others in the heterotype and homotype divisions of the pollen mother cells. The studies reported indicate that the 2 specific chromosomes of the 8-chromosome plants arose through aberrant division of 2 particular chromosomes of the 7-chromosome rye.

Sterility of rye, B. D. LEITH (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 129–132*).—An average of about one-third of 29,760 rye flowers were found to be sterile in a 3-year field study at the Wisconsin Experiment Station. In 84,133 flowers observed during the same period, where the individual spike was covered, sterility ranged from 96 to over 99 per cent in different varieties or in different years. In occasional heads, nearly half of the florets were fertile. The finding of considerable variation in different individuals in ability to self fertilize led to the isolation of a few lines producing large, well-filled heads.

A genetic analysis of maize, W. H. EYSTER (*Missouri Sta. Bul. 228 (1925), pp. 55–57*).—A study of variegation in corn (E. S. R., 53, p. 27) showed that orange pericarp, variegated pericarp of a number of distinct patterns, self-red pericarp, and colorless pericarp have a common origin. Mosaic pericarp was a very coarse type of variegation, and gave rise to a number of distinct patterns, self-red, colorless, and an orange colored pericarp similar to the orange noted above. Studies of 12 characters concerned with chlorophyll, 9 with plant abnormalities, and 2 with vivipary in corn (E. S. R., 52, p. 31) have been completed, and linkage relations have been established for 13 factors. Sterile plants (anther sterility) crossed with normal plants produced completely sterile plants. A giant type of corn arising in an inbred strain of Mastodon

has withstood inbreeding well, has wide, thick, and leathery leaves, and its hybrids promise to outyield commercial types.

The isolation of a pattern variety in piebald house mice, L. C. DUNN and G. B. DURHAM (*Amer. Nat., 59 (1925), No. 660, pp. 36–49, figs. 4*).—A true breeding race of piebald mice having white-faced spotting has been isolated by inbreeding at the Connecticut Storrs Experiment Station. Similar but not as uniform results were obtained with respect to dorsal spot or belting. The white-faced line was inbred for 14 generations and the belted line for 8 generations of brother-sister matings. The amount of white spotting was found to be more constant in these two lines than in normal piebalds, the coefficient of variability for the latter being about 88 per cent but less than half as much for the white-faced strain and about two-thirds as much for the belted stock. The 30 to 40 per cent of variability in the white-faced strain was thought to be nongenetic.

Crosses of the two piebald strains indicated that the white-faced stocks carried a dominant gene for the restriction of white spotting to the head and face. The F_2 ratios were, however, somewhat complicated by the appearance of white-faced belted mice. In crosses of the mice of the two piebald patterns with self-wild mice, the latter pattern was dominant, with segregation in the F_2 and back crosses. There were evidently other modifying genes brought in by certain of the wild animals used.

Inheritance of rate of feathering in poultry, D. C. WARREN (*Jour. Heredity, 16 (1925), No. 1, pp. 13–18, figs. 3*).—Clear-cut differences between rapid and slow rates of feathering in chicks have been observed among over 600 offspring of reciprocal crosses and F_1 back crosses of White Leghorns and Jersey Black Giants at the Kansas Experiment Station.

Rapid feathering birds developed tail feathers before 9 days of age, while slow feathering birds did not have tail feathers at 16 days of age. This character was controlled by a sex-linked factor in the crosses, slow feathering being dominant.

Inheritance of characters in sheep, A. E. DARLOW (*Oklahoma Sta. Bul. 153 [1925], pp. 15*).—Experiments to combine various desirable characteristics of the Shropshire, Dorset, Rambouillet, and Merino breeds of sheep have been continued (E. S. R., 42, p. 372). Twelve animals have been produced containing 22/64 Shropshire blood, 21/64 Dorset, and 21/64 Rambouillet, 12 animals containing 22/64 Dorset, 21/64 Rambouillet, and 21/64 Shropshire, and 12 animals have been produced containing 22/64 Rambouillet, 21/64 Dorset, and 21/64 Shropshire blood.

The observations on the inheritance of time of breeding, average weights of lambs at birth and 6 months, color, and wool characters are discussed. These results indicate that color, fineness of wool, fleece weight, smoothness and folds of the skin, and conformation are inherited in a blending manner. Fleece covering was dominant to bareness, and early breeding was partially dominant to late breeding in Dorsets selected for this character. Hornlessness of the Shropshire was incompletely dominant to the horned character of Dorsets. Fineness of wool and folds in the skin tended to be inherited together, as did dark face color and Shropshire characteristics.

Inheritance of hemophilia, B. LLOYD (*Jour. Heredity, 16 (1925), No. 1, pp. 28–30, figs. 2*).—The author presents pedigrees of two females in which bleeding has been common, and explains its inheritance on the basis of a sex-linked character which is mostly but not entirely recessive to the normal.

Four generations of hereditary chorea, C. K. CLARKE and J. W. MACARTHUR (*Jour. Heredity, 15 (1924), No. 7, pp. 303–306, fig. 1*).—The occurrence of Huntington's chorea in four generations of one family is described. No

choreic children occurred among the offspring of the normals produced by choreic parents, but about two-thirds of the children of choreic × normal parents were choreic. There were no choreic × choreic matings.

A comparison of the effects of X rays and temperature on linkage and fertility in Drosophila, J. W. Mavor and H. K. Svenson (*Genetics, 9 (1924), No. 6, pp. 588–608, figs. 8*).—Two experiments carried on at Union College, Schenectady, are described, in which the crossing-over in the second chromosome, sex ratio, and fertility were compared in females of *D. melanogaster* treated with X-ray doses designated as 16D and 32D and with heat at a temperature of 30° C. (86° F.) for 48 hours. The X-ray treatments lasted 10 and 20 minutes, respectively. The flies used in the control, X-rayed, and treated lots were full sisters. The offspring appearing from the eggs laid during the different periods up to 15 days after the treatments were observed.

The combined results of the two experiments indicated that both the heat and X-ray treatments increased the crossing-over occurring during definite periods following the treatment. Heat caused a distinct increase in the amount of crossing-over between the black and purple genes in eggs laid on the sixth, seventh, and eighth days following the treatment, while significant increases from X-raying began one day later but continued to the end of the experiment. The crossing-over in the region purple-to-curved was influenced in much the same way, except that the significant increases started in eggs laid on the seventh day in both cases. The fertility of the X-rayed flies was very low during the first few days, but gradually increased until it equaled the control and heat-treated flies after the ninth day, thus indicating an initial lethal effect of X-raying.

These experiments are continuations of those previously noted (E. S. R., 52, p. 129).

Studies of coat-color and foot pigmentation in subspecific hybrids of Peromyscus eremicus, F. B. Sumner and R. R. Huestis (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 48 (1925), No. 1, pp. 37–55*).—A more complete account of the study previously noted by the junior author (E. S. R., 50, p. 731).

Sex of over-term calves, J. J. Hooper and J. W. Nutter (*Jour. Heredity, 15 (1924), No. 11, p. 462*).—In 44 gestation periods of over 287 days in duration occurring in the dairy herd of the Kentucky Experiment Station, 26 of the calves born were bulls and 18 heifers, making 59 per cent males and 41 per cent females. This tends to substantiate the assumption of livestock breeders that males more frequently result from long gestation periods.

Seasonal distribution of twin births in cattle (*Wisconsin Sta. Bul. 373 (1925), pp. 87, 88, fig. 1*).—A study by L. J. Cole and A. Rodolfo of the seasonal distribution of twin births listed in the *American Hereford* and *Aberdeen Angus* herdbooks showed that the largest number of twin births occurred in August, and that there was a tendency for greater numbers to occur during the late summer and fall than at the other seasons of the year. The fewest twins occurred in March.

Experiments on the sheep testis: Cryptorchidism, vasectomy, and scrotal insulation, C. R. Moore and R. Oslund (*Amer. Jour. Physiol., 67 (1924), No. 3, pp. 595–607, figs. 6*).—In experiments with sheep at the University of Chicago, the authors found that ligation and resection of the vas deferens for 90 days did not result in degeneration of the glandular tissue of the testicle, while placing the testicle in the abdominal cavity or wrapping the scrotum sufficiently to prevent loss of heat resulted in degeneration of the cells of the seminiferous tubules.

The effect of copulation, pregnancy, pseudopregnancy, and lactation on the voluntary activity and food consumption of the albino rat, J. R. Slon-

AKER (*Amer. Jour. Physiol.*, *71* (*1925*), *No. 2*, *pp. 368–394*, *figs. 8*).—In continuing the study of the voluntary activity associated with the sexual phenomena in rats, the author has made an investigation of the effect of copulation, pregnancy, pseudopregnancy, and lactation on the voluntary activity and food consumption of females, using the methods employed in earlier studies at Stanford University (E. S. R., 51, p. 527). The major portion of the work is based on data obtained from the mothers of 56 litters. The results of the study are given in detail in tables and graphs and may be summarized as follows:

Normal nonpregnant females produced an average of from 8,000 to 10,000 revolutions of the cages and consumed about 18 gm. of food per day, while the average daily activity of pregnant females was reduced to 3,388 revolutions and the food consumption increased to 20 gm. There was a marked increase in activity preceding mating (oestrum) to 16,352 revolutions, but following copulation the activity was reduced to 2,779 revolutions. This was followed by a slight increase in activity, which was fairly well maintained until a short time prior to parturition, the average for the day preceding parturition being 2,072 revolutions. There was a further drop in the activity to 935 revolutions for the day following parturition. The food consumption was likewise very low at this time. During lactation, activity was less than during pregnancy, with a gradual rise toward the end of the period. Lactation was accompanied by a large increase in food consumption, running as high as 65 gm. on the twenty-fifth day.

The effect of other factors on these averages was investigated by rearranging the data. Litter size was found to exert a distinct influence. Mothers with litters smaller than six exercised less and ate more food than mothers of larger litters. The gestation period of large litters and young mothers was somewhat shorter than for small litters and older mothers. The food consumption during lactation was distinctly affected by the size of the litter and somewhat influenced by the amount of voluntary activity and maturity. Typical oestrous periods were absent during gestation and the first 20 days of lactation, but increased activity of certain individuals indicated that oestrum might occur during gestation, the activity being centered around the fourth, eighth, twelfth, and sixteenth days. One female continually mated for 21 days gave birth to 3 young and 15 days later gave birth to 5 young which were reared. Oestrum was generally suppressed during the first 18 to 20 days of lactation but occurred in some females, the more common days being the first, fifth, eleventh to fourteenth, and eighteenth days after parturition. Eating of the young or removing the young immediately after birth tended to be followed in a short time by oestrum, though this varied considerably in individuals from the first to the twenty-second day, as was determined by the time the next litter was born.

The marked decrease in the voluntary activity following copulation was an outstanding result of the investigation. A similar decrease also followed the stimulation of the cervix uteri with a glass rod, and pseudopregnancy usually resulted from the latter operation.

The interruption of pregancy by ovariectomy in the aplacental opossum: A study in the physiology of implantation, C. HARTMAN (*Amer. Jour. Physiol.*, *71* (*1925*), *No. 2*, *pp. 436–454*, *figs. 12*).—In experiments at the University of Texas, 38 ovariectomies were performed upon female opossums in various periods of the oestrous cycle or pregnancy, and it was uniformly found that the removal of both ovaries resulted in the death of the embryos and the return of the uterus to the resting condition. The death of the embryos was due to malnutrition caused by a collapse of the central layer of the uterine

mucosa from which the lymph is resorbed and not to interference with the decidual reaction of L. Loeb, since no placenta is formed in this animal. Unilateral ovariectomy, even with hysterectomy on the opposite side, had no effect on the uterus or the development of the embryos.

The effect of X-rays on the fertility of rats, L. H. Snyder (*Amer. Nat., 59 (1925), No. 660, pp. 87–91, figs. 2*).—The effect of X-rays on the fertility of male rats was investigated at the Bussey Institution. The scrotum only was exposed to the rays, the rest of the body being protected by lead plates. The X-raying periods varied in length from 1 minute to 1 hour. Thick and thin aluminum filters were used, and in the later experiments no filters. When using the thick filter, no effect on the fertility of the exposed males resulted, but with the thin filter or with no filter X-raying for longer than 35 minutes produced sterility, beginning from a few weeks to 66 days after the X-raying. The sterility period lasted for 2 months or more, after which normal fertility again followed.

Heredity and environment, H. S. Jennings (*Sci. Mo., 19 (1924), No. 3, pp. 225–238*).—Heredity is explained largely on a chemical basis in which characters may be changed or modified in a variety of ways by the environment.

FIELD CROPS

[Field crops work in California] (*California Sta. Rpt. 1924, pp. 32–35*).—The merits of Harding grass, berseem clover, calcarata, purple vetch, moth bean, Moki bean, hyacinth bean, and improved varieties of wheat, barley, oats, and grain sorghums are indicated as heretofore (E. S. R., 52, p. 32), together with comment on the value of crop rotations and the removal of alkali by irrigation for rice (E. S. R., 51, p. 638).

[Agronomic experiments in Guam, 1923], J. Guerrero (*Guam Sta. Rpt. 1923, pp. 4–10, figs. 3*).—Variety trials with grasses, sorghums, small beans, alfalfa, sweet potatoes, yams, and adlay, cultural tests with grasses, and fertilizer experiments with rice are reported on as heretofore (E. S. R., 52, p. 226).

Napier grass and Guatemala grass have kept down weed and other growth better than Japanese cane. Broadcasting or strewing cuttings on newly cleared or plowed land during the rainy season has been the cheapest method of planting Para. At Cotot, however, the stand resulting from this method was more easily killed by pasturing than when grown by methods allowing for the establishment of a deeper root system. Crops of sorghum maturing in the rainy season have produced a high forage and a low grain yield compared with crops maturing in the dry season or period of light rains. Attempting to obtain more than five crops from a single planting is considered unwise.

Black mungo gave the highest grain yield of the small bean varieties tested but was the latest to mature. Adzuki beans made the poorest cover crop but ripened first. In general, the highest yields resulted from the plantings of December 16, about the beginning of the usual dry season in Guam.

Fertilizer experiments with rice during seven years have shown that acid phosphate in combination with ammonium sulfate produced the highest yield of clean, unhulled paddy, averaging 61 per cent above the check plats. Plats receiving these materials with potassium sulfate for two seasons made the next highest yield. A plat receiving sodium nitrate alone produced about 65 per cent more clean paddy than that receiving ammonium sulfate alone. When applied in combination with other fertilizing materials, ammonium sulfate produced a much higher yield than did sodium nitrate. In tests the fertilizers applied singly, acid phosphate gave the best results and was

followed by sodium nitrate. Acid phosphate in combination with potassium sulfate gave the poorest results, and lime alone or in combination with fertilizers failed to equal the untreated plat. Rice fields surrounded by cultivated or fallow fields do not appear so subject to rice bug attacks as are those near brush and grass.

Barnyard manure gave better results than lime, sulfur, or green manure in treating newly broken native grasslands which fail to produce satisfactory yields of certain crops. Corn rotated with cowpeas and with velvet beans has generally given some increase in yield over corn in continuous culture.

[Crop trials at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and E. W. Moore (*Indiana Sta. Circ. 123 (1925), pp. 6, 7, 8–12, figs. 2*).—Seeding tests with clover and sweet clover and fertilizer tests on pasture are reported on as heretofore (E. S. R., 52, p. 226). Varietal leaders have included Purkoff and Fultz winter wheat, Mammoth Winter and common rye, Johnson County White and Alexander Gold Standard corn, and Minota, Iowa 103, and Swedish Select oats.

[Field crops experiments in Missouri, 1923–24], W. C. Etheridge, C. A. Helm, L. J. Stadler, J. T. Quinn, M. F. Miller, and F. L. Duley (*Missouri Sta. Bul. 228 (1925), pp. 52–55, 61, 79, 80*).—Experiments continuing earlier work (E. S. R., 48, p. 628; 51, p. 740) included comparisons of forage crops, and varieties of corn, grain sorghum, and sorgos for grain and forage at Cuba, a cultural and fertilizer test with oats and spring barley at Maryville, variety tests with oats and barley, and breeding work with wheat.

Soy bean varieties decidedly surpassed cowpea varieties in production of seed and hay in both 40-in. rows and 8-in. drills. Seeding rates ranging from 15 to 30 lbs. per acre in rows were not followed by significant yield differences. Early seedings were generally most productive when four varieties of soy beans were planted for seed from May 15 to July 15. When these varieties were harvested for hay at stages from full bloom to the falling of leaves, the hay yields generally increased with the stage of maturity.

In investigations with potatoes, certified northern grown seed continued to produce more profitable crops than noncertified northern seed. The hot formaldehyde seed treatment controlled Rhizoctonia and common scab about as well as the corrosive sublimate treatment. Potatoes kept in cold storage during the entire storage period showed a higher percentage of germination and a more uniform vine growth than those stored under ordinary conditions.

In studies of the effect of different amounts of and different methods of applying commercial fertilizer on corn, summer drought and delayed plantings both greatly reduced the beneficial effect of the fertilizer. In general, broadcasting fertilizer has given better returns than applying fertilizer in the row, while side applications at the second or third cultivation of corn have given inconsistent and usually unsatisfactory returns. While fertilizer applied to corn in central Missouri, considering the corn alone, was hardly profitable because of drought, the returns on the following crop of soy beans were quite marked.

[Field crops experiments in New Hampshire, 1924] (*New Hampshire Sta. Bul. 216 (1925), pp. 16–18, 32, 33*).—Experiments with potatoes by O. Butler dealt with the effect of climate on productiveness, spraying, size of seed, and certification. With a sprayer applying Bordeaux mixture under 90 lbs. pressure, better protection seems obtainable by going over the row twice than by using three nozzles over the row once; 180 lbs. pressure gives better protection than 90 lbs., and 90 lbs. over a row twice is not so good as 180 lbs. at one application. Going over the row twice greatly

increases the protection but is uneconomical if the sprayer will carry three nozzles per row and apply the mixture at 180 lbs. pressure.

Nitrate applied to pasture by F. W. Taylor was effective for one season only, while plats receiving lime or grass seed were better than the checks. Liming and seeding in June with oats gave fair results with alfalfa. Potash tests on potatoes are also noted.

[Field crops investigations in Wisconsin, 1923–24] (*Wisconsin Sta. Bul. 373 (1925), pp. 25–40, figs. 8*).—Experiments with field crops continued previous investigation (E. S. R., 51, p. 434). Outstanding among varieties have been the Horal canning pea; cold-resistant Golden Glow corn; Forward, Early Gotham, Wisconsin Wonder, and Pedigree No. 8405 oats; Progress spring wheat and Pedigree 11825 winter wheat; Ferramington early hemp and Kyington and Chington late hemp; and Mandarin and Manchu soy beans. The profitableness of flax and the hemp industry in the State, the unsatisfactory behavior of foreign red clover seed, seeding tests with oats and hemp, fertilizer tests with hemp, and breeding work with sweet corn are also reported on.

Alfalfa investigations were carried on by L. F. Graber, N. T. Nelson, W. B. Albert, and D. Schmidt. Two crops of alfalfa cut at or near the full-bloom stage yielded more hay than three crops cut earlier. Alfalfa cut twice a year and also in full bloom averaged 1.1 tons more hay per acre and also more digestible protein and total digestible nutrients than that cut three times at the bud and tenth-bloom stages. Early cuttings permitted the increase of blue grass in the alfalfa fields. Recent experiments (E. S. R., 53, p. 232) showed that frequent and early cuttings exhaust the root reserves and lower the vigor of the plant. The diameter of the roots is appreciably greater in the plants cut only twice a year, the effects increasing with the earliness and frequency of cutting. Two hundred roots two and three years old from the full-bloom series (two cuttings) produced 85 per cent more dark room top growth than did 200 roots of the same ages from the bud-stage plats where three and four crops had been taken annually, i. e., roots high in food storage greatly excelled. Roots from 5-months-old seedling plants not cut previous to transplanting made the greatest dark room top growth per unit of weight, suggesting why new seedings are generally hardier and more winter resistant than old plants whose reserves were lowered by previous cutting. Analyses showed that the amount of available carbohydrates, including sugars, and also of both soluble and insoluble nitrogen in the roots of the plants cut twice in full bloom was more than double that in plants cut earlier and more often. Under severe conditions in the State winter-killing in Grimm alfalfa was very much less than with the common strain. The loss due to winterkilling decreased with delay in cutting.

Seeding alfalfa just before the last cultivation of corn produced a satisfactory stand on the heavier fertile soils. No serious injury seems likely to result from smothering in autumn because of the density of the alfalfa. Heavy fall growths left uncut were found to serve as a splendid protection against winter injury. Growing the plant to maturity was not injurious, and the seed produced under Wisconsin conditions was found highly satisfactory. While scarification increases the immediate germinability of hard seeds, experiments indicate that scarified seed should never be retained for an extended period.

Soy beans for seed can apparently be harvested best with a grain binder similarly to the small grains. Where soy beans are to be used as hay the ordinary mower may be used, the curing treatment being similar to that with

clover hay. Soy beans in corn for silage combination could not be recommended on the heavy clay soils of the State.

Dry-farming in the Sulphur Spring Valley, G. E. Thompson and F. G. Gray (*Arizona Sta. Bul. 103* (*1925*), *pp. 335–357, figs. 9*).—Experiments with field crops at the Sulphur Spring Valley Dry Farm are reported on, with comment on the climatic and environmental conditions, the results of a farm survey in the valley are summarized, and dry-farming practices are recommended. The annual rainfall has ranged from 5.96 to 18 in. during the period 1913–1924, averaging 12.06 in. The work of the station and the experience of farmers show that dry farming in the Sulphur Spring Valley is not profitable.

Sorgos for forage and the grain sorghums for grain have been the most dependable, high yielding, and generally most successful crops grown on the farm. Sumac and Orange sorgos made the highest yields in years with the heaviest rainfall, while such varieties as Red Amber, Black Amber, and Freed sorgo proved more profitable in dry years. Dwarf Yellow milo has been the outstanding grain sorghum. Native Indian varieties of corn, tepary beans, and pink beans have given fair results. In the years of abundant rainfall Mammoth sunflowers made fair yields, but in relatively dry years the small yield was unprofitable. Sunflower silage was good, but not equal to sorgo silage. Plantings of sorghums, tepary beans, and sunflowers made after the beginning of summer rains have given the best yields. Small grains, alfalfa, sweet clover, cowpeas, soy beans, and velvet beans were not successful on dry land. While large yields of legumes, small grain, corn, and soy beans can be grown if irrigation is adequate, irrigation with pumped water has not been generally profitable. Dynamiting the subsoil has not paid in crop production.

Cultural trials and analyses of silage from careless weed (*Amaranthus palmeri*) indicate that this weed, which grows abundantly in the dry-farming regions of the State, may be utilized to advantage in making silage.

Annual forage crops, T. A. Kiesselbach and A. Anderson (*Nebraska Sta. Bul. 206* (*1925*), *pp. 3–45, figs. 8*).—Variety, cultural, and seeding tests with annual forage crops were carried on during the period 1921–1924. Of the annual forage crops, the sorgos produced the most cured forage. Black Amber sorgo, yielding 4.65 tons per acre, was surpassed by 7 later maturing sorgos and 1 grain sorghum. Sudan grass, common millet, and German millet yielded, respectively, 70, 75, and 75 per cent as much as did sorgo, and comparable alfalfa hay yields averaged 4.09 tons per acre. Its early maturity and relatively fine growth make Black Amber very satisfactory for the entire State, but the better yields of Red Amber, Early Sumac, and Western Orange, medium late sorgos, justify their more extensive trial in southern Nebraska.

As a 3-year average, sorghum, Sudan grass, and alfalfa hay contained 5.7, 6.6, and 18.8 per cent, respectively, of protein; 52.8, 46.8, and 40.7 per cent of nitrogen-free extract; and 30.7, 35.6, and 28.3 per cent of crude fiber.

Corn grown in different localities for grain yielded from 55 to 71 per cent as much fodder, sheaf oats from 28 to 39 per cent as much, and Sudan grass from 47 to 76 per cent as much as sorghum grown for forage. The relative superiority in total production of sorghum over corn increases as growth conditions become more unfavorable.

During 7 years at the station, sorgo, Sudan grass, kafir, and field corn made their highest yields with a press drill. The yields indicated that sorghum and Sudan grass should be seeded soon after corn planting. There may be a rather wide range in seeding rates without a decided change in the yield. Coarseness of the forage as measured by stem diameter may be materially changed by seeding rates, but such change did not affect very decidedly the chemical composition of sorghum and Sudan grass forage and the acre yield of nutrients.

The highest yields from sorgo and Sudan grass can be expected if they are harvested when rather mature. However, Sudan grass should be harvested before full maturity to avoid reduction of the yields by shattering of leaves and seed soon after the seed has attained the soft dough stage. While the chemical composition of sorghum and Sudan grass hay depends largely upon the maturity of the crop at harvest, the highest acre yield of nutrients generally corresponds with the highest acre hay yield. When fed to cattle in conjunction with some corn silage, 71 and 62 per cent of the sorghum and Sudan grass hay, respectively, were consumed. In a rate of curing test, Sudan grass hay had 26 per cent of moisture when sorghum still contained 46 per cent.

Corn was found to yield the most silage at 4 plants per hill, and the highest grain yield was produced at 3 plants per hill. The local full-season types of corn were found best to grow for silage.

Black Amber, Red Amber, Early Sumac, and Kansas Orange sorgos, and Blackhull kafir made relative yields of 100, 107, 110, 106, and 95 per cent, respectively, in a silage test, with corresponding relative grain yields of 100, 89, 69, 29, and 64 per cent. Black Amber sorgo and corn planted at the optimum rate yielded 3.27 and 3.44 tons of silage per acre, respectively, with corresponding grain yields of 29.9 and 43.6 bu. The combination of corn and soy beans is not recommended as a silage crop in the State. The tonnage from sugar beets, mangels, and rutabagas, on a 15 per cent moisture basis was about half that of Black Amber sorgo planted for hay and silage.

Breeding better corn (*Connecticut State Sta. Bul. 264 (1925), pp. 197, 199, fig. 1*).—Red Evergreen, a sweet corn produced by selection in a self-fertilized line and crossing of fixed inbred strains, has decidedly outyielded standard Evergreen. A strain of sweet corn selected for freedom from root and ear rots yielded 173 bu. as compared with 154 for unselected seed, and in the selected seed the percentage of disease declined from 51 to 18 in four years.

Nonparasitic factors influencing lodging [of corn], B. KOEHLER, G. H. DUNGAN, and J. R. HOLBERT (*Illinois Sta. Bul. 266 (1925), pp. 334–369, 370, 371, figs. 18*).—A number of nonparasitic factors other than seasonal and climatic variations were found to have a profound influence on lodging of corn.

Commercial strains of corn, even practically free from seed infection, vary considerably in respect to lodging. Time of planting may markedly influence the relative percentage of both leaning and broken stalks. Corn planted two kernels per hill stood more erect than that planted three kernels per hill. When corn followed several consecutive corn crops, the percentage of leaning plants was much greater than with corn on virgin sod or after a legume. The percentage of broken stalks was not affected thereby. Application of 4 or more tons of limestone per acre to the soil decreased the percentage of leaning plants but did not influence the percentage of broken stalks, nor did it affect the yield of grain much. Barren stalks, on the average, leaned to a greater extent than stalks bearing ears.

Great differences as to lodging were observed in a number of self-fertilized strains even though practically disease-free seed was used throughout. Of strains growing to about the same height, an erect strain had a root system about twice as great as one inclined to lodge. Plants tending to lodge also had less resistance to a vertical pull (E. S. R., 51, p. 36). Self-fertilized strains also varied greatly in the tendency of the stalks to break during the latter part of the growing season and after maturity, some having practically no broken stalks up to winter, while other strains were broken down completely at that time. Such differences seem to indicate that it may not be difficult to

develop commercial strains with very little tendency toward stalk breaking even under adverse conditions.

Cotton variety tests in Oklahoma, G. Briggs (*Oklahoma Sta. Bul. 154 [1925], pp. 3–12*).—Acala No. 5, Oklahoma Triumph 44, Mebane, and Lightning Express were the leading varieties in money value per acre at the station in 1924. These sorts, and Rowden, Trice, and Rivercrest showed up well in cooperative tests in different parts of the State during three years.

Results of fertilizer experiments with cotton, 1924, M. Nelson and W. H. Sachs (*Arkansas Sta. Bul. 195 (1925), pp. 3–12, figs. 3*).—In cooperative fertilizer experiments with cotton (E. S. R., 51, p. 725) carried on in Arkansas during 1924, nitrogen and potash gave unusually good results, due largely to the dry climatic conditions and light boll weevil infestation. While nitrogen is the limiting element with cotton in the State as a whole, its best returns will rarely be had unless it is used with phosphoric acid and potash. Basic fertilizer recommendations for cotton on Coastal Plain soil are 400 lbs. of 10–4–4 fertilizer per acre, on hill soil 400 lbs. of 12–4–4, and for lowland soils of medium to lower fertility 400 lbs. of 10–4–2 fertilizer. On the heavy soils of the lowland section, from 100 to 150 lbs. of sodium nitrate alone may be used. Results obtained from the use of manure should encourage its better preservation.

Trials with new oat varieties conducted by Iowa farmers, H. D. Hughes and J. L. Robinson (*Iowa Sta. Bul. 227 (1925), pp. 313–342, figs. 14*).—Several pure-line pedigreed oats varieties developed at the station were compared with each other and with commercial varieties by farmers on the five principal soil areas of the State. The yield data are tabulated, with the results of a survey of oats varieties in Iowa and the requirements for certified and registered seed.

Iowa 103, a white-grained, early oats selected from Kherson, outyielded the home varieties 3.73 bu. per acre in 292 local tests. Its greatest superiority was shown in southern Iowa, although excellent results were had in central and northern Iowa. Iowa 105, an early maturing, short-strawed oats recommended for rich black soils, in 205 tests outyielded home varieties 2.53 bu. Iowar, a white-grained, early variety, made a somewhat greater growth of straw and grain yield at the station than Kherson from which it was selected. Iowar is better suited to northern Iowa than to southern Iowa, and in 330 tests it outyielded home varieties 5.93 bu. Iogren, a medium late-maturing, yellow-grained variety selected from Green Russian, makes a greater yield of straw than the other varieties distributed, and in 111 tests it outyielded the home varieties 3.64 bu.

Over 46 per cent of the acreage of oats in Iowa in 1924 was planted with varieties originating at the station. Iowa 103 constituted 23.2 per cent of the total oats acreage, Iowar 13.5, Iowa 105 8.7, and Iogren 0.8 per cent as compared with Kherson 11.1 per cent, Green Russian 11.7, Early Champion 3.8, and Silvermine 3.6 per cent.

Soybeans—a good legume crop, R. A. Moore, E. J. Delwiche, and G. M. Briggs (*Wisconsin Sta. Bul. 375 (1925), pp. 32, figs. 13*).—The uses of the soy bean, its place in the cropping system, and cultural and field methods and harvesting practices are described, and varieties are indicated for soil types in different sections of Wisconsin. Experiments with the crop in the State are reviewed briefly.

The effect of age on germination of tobacco seed (*Wisconsin Sta. Bul. 373 (1925), pp. 16, 17*).—J. Johnson and H. F. Murwin found that different samples of tobacco seed varied considerably as to the effect of age in deterioration. Seed with high initial germination usually retains a germinability ade-

quate for general commercial sowing for at least five or six years. Old seed, however, germinates more slowly than new seed. Tobacco seed germinates best around 88° F. and can not germinate below 56°. Light seems to have no appreciable influence on germination. While seed from pods picked when three-fourths grown have germinated well, it seems safest to permit the pods to become at least partly dry before harvesting. By blowing out light and immature seed a seed-cleaning machine has increased the germination of poor tobacco seed as much as 30 per cent.

Seed analyses, 1921 to 1924, C. M. King (*Iowa Sta. Bul. 226 [1925], pp. 291–311*).—Tabulations show the average germination, purity, and hard seed content, and the occurrence of seeds of other crops and weeds in 4,747 samples of commercial seed tested during the period July 1, 1921, to July 1, 1924.

Weeds and their control, E. J. Petry (*South Dakota Sta. Bul. 211 (1924), pp. 84, figs. 46*).—The damage caused by weeds and the fundamentals and methods of weed control are discussed, keys to weed families are presented, and descriptions, illustrations, and special control methods are given for 44 of the worst weeds in the State. A brief bibliography is appended.

HORTICULTURE

[Horticultural investigations at the California Station] (*California Sta. Rpt. 1924, pp. 51, 60, 61*).—This, the annual report (E. S. R., 52, p. 39), contains information upon the nature and progress of investigations.

Irrigation studies with fruit trees indicated that weekly cultivation throughout the summer is unnecessary, tillage in itself being of little value in the conservation of moisture. Apparently one cultivation following each irrigation is sufficient except where weeds become abundant.

In work with vinifera grapes, it was found that thinning the bunches was more effective in respect to improving quality and increasing yields than was winter pruning. In the case of the Muscat of Alexandria and Monukka the increase in yields following bunch thinning amounted to 84 and 11 per cent, respectively.

[Horticultural investigations at the Guam Station], J. Guerrero (*Guam Sta. Rpt. 1923, pp. 10, 11, fig. 1*).—As in previous years (E. S. R., 52, p. 232), there are presented brief notes on the progress of investigations.

Girdling as a means of inducing fruiting in nonbearing trees was in most cases successful. However, in citrus such treatment was often followed by the subsequent death of the affected limbs. The Washington Navel orange produced on the island is reported as decidedly inferior in eating quality to many of the native varieties. Nitrate of soda proved superior to ammonium sulfate for the first crop of pineapples, while the reverse was true with the second crop.

[Horticultural investigations at the Missouri Station], T. J. Talbert et al. (*Missouri Sta. Bul. 228 (1925), pp. 57–59, 60, 61, 62, figs. 2*).—Herein are presented, as usual (E. S. R., 51, p. 745), concise notes upon the progress of investigational activities during the year.

Grafting operations conducted by Talbert, in which seedling black walnuts were top-worked with improved varieties, such as Stabler, Thomas, and Ohio, indicated the possibility of improving this valuable native nut. Difficulty was experienced in attempts to cleft-graft pecan scions upon the native hickories.

As reported by H. D. Hooker, jr., and H. G. Swartwout, trees of the York Imperial, a naturally biennial bearing apple, responded to fall applications of nitrate of soda by producing their fourth annual crop, despite the fact that spur examination showed them to have been biennial bearers previous to fertilization.

Spray investigations carried on jointly by Talbert, Hooker, Swartwout, and A. M. Burroughs resulted in the development of a successful oil emulsion spray which, prepared without heat by using calcium caseinate instead of potash fish oil soap, was found not only cheaper in cost and easier to prepare but also more stable than those already in use. Studies of the effect of oil sprays upon fruit trees indicated that concentrations of oil below 5 per cent may be safely applied to dormant trees. Evidence was secured to indicate that 2 per cent oil sprays may be safely applied up to the cluster-bud stage. Oil sprays applied after blossoming apparently were deleterious to the apple and caused severe injury to the foliage of stone fruits. Work with Bordeaux mixture indicated that the method of making has no effect on the amount of injury to the fruit, and that severe burning follows applications two weeks after the calyx spray. The size of the leaves and the partly grown fruits was reduced by Bordeaux mixture applications.

Records taken by Burroughs showed that none of the seedling peaches planted in 1920 possessed the late blooming habit desired as a protection against spring frosts. Better results were obtained with apples, of which from 40 to 50 of the 250 seedlings examined were found to be late bloomers. Of these late bloomers, 10 were selected as possessing desirable commercial qualities.

As reported by J. T. Quinn, no marked differences in yield were observed between cantaloupes of the same variety raised from seed obtained from Colorado, Florida, and Missouri. The best yields of cantaloupes were secured from the use of 600 lbs. per acre of a 3–12–4 fertilizer applied in the hill. An application of 500 lbs. per acre was found approximately equal in value to 5 tons of well-rotted manure, both materials applied in the hill.

[Horticultural investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 216 (1925), pp. 13, 14, 20–31*).—Records taken by G. F. Potter and S. W. Wentworth in the Woodman orchard of Baldwin trees showed that ruffed grouse injury to fruit buds, mentioned in the last annual report (E. S. R., 51, p. 141), materially reduced production. Measurements on the trees showed that those receiving fertilizers in addition to tillage and cover crops are making the greatest growth. Grading the fruit according to quality showed that color is materially reduced by all fertilizer applications.

Records taken in the spring of 1923 upon Duchess apple trees, which in 1922 bore a full crop of blossoms and were treated as follows: (1) No treatment, (2) all blooms removed, and (3) every other spur deflorated, showed 9.2, 41.4, and 10.3 per cent of blossoming spurs, respectively.

Data taken by Potter on 6-year-old apple trees composing a pruning experiment showed no marked growth differences correlated with the type of pruning, the gains in trunk circumference being 0.42, 0.47, 0.5, and 0.26 in., respectively, for vase, semileader, full leader, and unpruned trees, the unsatisfactory growth of the unpruned being thought due to their location on an infertile site. Trunk measurements in a peach orchard severely pruned following winter injury to the buds and top showed the favorable effect of nitrogen upon growth.

That nitrate of soda applied to strawberries at the rate of 300 lbs. per acre, either in the spring just before flowers opened or in installments in the fall and spring, may have a deleterious effect on yield was indicated in studies conducted by Wentworth, the installment nitrate plats averaging 16.8 and the spring nitrate plats 18.4 per cent below the control.

Following up work outlined in the preceding station report upon the effect of disbudding by birds upon Wealthy apples growing at Contoocook, H. A. Rollins and Potter report that measurements in the spring of 1924 have shown no

significant effect of the bud injury upon trunk growth. It is thought, however, that the greater production in 1923 of the normal trees may have reduced their trunk growth. Counts in 1923 and 1924 of the number of spurs on normal and injured trees showed an average increase of 23.3 per cent in the number of spurs upon normal trees and an average loss of 2.1 per cent for injured trees. The total gain of the injured trees, using the reduced number of spurs in 1923 as a basis, was, however, 47.5 per cent. A study of the effect of bird injury on fruit bud formation in 1923 and 1924 showed 39.7 per cent of fruit buds for the normal and 41.4 per cent for the injured trees for the two seasons, leading the authors to conclude that disbudding had no significant effect on the proportion of fruit buds. Records taken in 1923 and 1924 of the number of spurs setting fruit and the number of apples on each spur showed an average set for the two years of 68.5 for injured and 53.1 for the normal trees.

Yields presented by J. R. Hepler for Blue Hubbard squash grown on the permanent soil fertility plats in 1924 showed a marked response of this crop to applications of readily available fertilizers, either in the form of stable manure or manure plus commercial materials. Lime applied across the fertilizer plats had no significant effect upon yield. Green manure supplemented by commercial fertilizers increased the yield approximately three times that of green manure alone, and 8 tons of stable manure supplemented by fertilizers was practically as effective as 32 tons of the manure alone.

Fertilizer studies with the tomato, carried on by Hepler, again showed (E. S. R., 49, p. 234) that acid phosphate tends to hasten maturity and increase the yield. Records showed an increased early growth on acid phosphate plats and a close correlation between the total size of the plants and the number of clusters produced at any given date. Total yields for three representative dates in early, mid, and late season indicated that yields of ripe fruit are closely correlated with increase in size and number of flower clusters. A similar experiment carried on in the greenhouse indicated that under indoor conditions temperature is the active factor in determining maturity. However, acid phosphate gave the highest yields and potash alone slightly increased yields, but when used in combination with acid phosphate potash decreased the yields below those secured with acid phosphate alone. Attempts by Hepler to segregate high and low yielding strains from a closely inbred selection of Bonny Best were fruitless. Observations on 17 varieties of tomatoes showed that only early and midseason varieties are of value for New Hampshire. Dwarf types yielded so poorly that their use is discouraged.

[Horticultural investigations at the Wisconsin Station during 1923–24] (*Wisconsin Sta. Bul. 373 (1925), pp. 16, 17, 18*).—Working with the apple, R. H. Roberts found fertilized ovules in fruits of the third drop, demonstrating that dropping is not due to lack of pollination. Finding the rate of growth of pollen tubes in self-pollinated apple blossoms to be as rapid as in cross-pollinated blossoms, Roberts suggests that it is probably a premature cessation rather than a slow rate of growth that results in sterility in self-pollinated fruits. Detailed observations on blossom buds indicated that their formation is directly associated with the secondary thickening of the wood growth which follows the cessation of terminal elongation. Pruning was found to have an effect on blossom bud formation similar in nature to that previously secured by varying the nitrogen fertilizers, suggesting that the type of growth which results is due to factors associated with blossom bud formation and not to any particular cultural treatment.

Studies by F. A. Aust of the factors concerned in the propagation of ornamental shrubs indicated that a temperature range between 46 and 89° F. [illegible] for propagation, with the soil preferably 2° warmer than the air.

An alternation of high and low temperatures was found more favorable than a constant optimum. Alpine currant and high bush cranberry cuttings exhibited the maximum rooting tendency just before or near the time that lignification commences.

Fruit-bud differentiation in deciduous fruits, W. P. TUFTS and E. B. MORROW (*Hilgardia [California Sta.], 1 (1925), No. 1, pp. 1–14, pls. 11*).—Following a summary of the present status of knowledge of the nature and the time of bud differentiation in various fruits, the authors present data for the Nonpareil almond, Gravenstein apple, Royal apricot, Early Richmond and Napoleon cherries, Elberta peach, Bartlett pear, and French (prune) and Wickson plums, using the time of definite broadening and thickening of the floral axis as indication of the beginning of differentiation. The approximate dates of differentiation for the fruits mentioned were, respectively, (1) late August to early September, (2) middle of June, (3) early August, (4) early July, (5) late June to early July, (6) late July, (7) late June to early July, and (8) and (9) late July to early August.

The illustrations include photomicrographs of buds of the various fruits and also drawings depicting the seasonal development of the Royal Apricot and Bartlett pear buds as affected by pruning treatments, irrigation, environment, etc.

Fertility in the apple orchard, R. D. ANTHONY and J. H. WARING (*Pennsylvania Sta. Bul. 192 (1925), pp. 15, figs. 5*).—That phosphorus may under certain conditions become an important factor in orchard fertility was indicated in records of yield and growth taken in the experimental apple orchard established on the station grounds in 1908. Under a uniform treatment embracing annual tillage followed by a nonleguminous cover crop, those plats receiving no acid phosphate failed to support a cover crop capable of maintaining the essential organic matter in the soil. Fifteen years were required for the cover crop deficiency to affect the trees notably. That alfalfa is a valuable intercrop for apples was shown in the thrifty growth of trees which had been in alfalfa nearly every year for 16 years. In vigor and yield these trees were comparable to sod trees receiving heavy applications of nitrogen and to cultivated trees with and without added fertilizer.

That even a slight slope in the orchard may affect the behavior of experimental trees was indicated in high yield and large average trunk circumference of trees in an untreated plat lying slightly lower than fertilized areas. Again, a nitrogen plat lying in a low, poorly drained area failed to attain normal condition.

Observations upon unfertilized Stayman Winesap trees grown with leguminous and nonleguminous cover crops showed a distinct advantage from the use of legumes, as indicated in greater spread of the branches. An attempt to grow apple trees without fertilizer or cover crop ended in distinct failure, the project being abandoned after 12 years in order to save the trees from starvation. At the same time unfertilized trees interplanted with a cover crop made a moderately successful growth. That apple varieties differ in their response to soil treatments was indicated in the better performance of Stayman Winesap under adverse soil conditions than either York Imperial or Baldwin.

Moisture determinations taken in the earlier life of the orchard showed more soil moisture beneath sod than beneath tillage except in the case of continuously tilled plats. This is explained in the light of the high annual rainfall characteristic of the region.

In general conclusion the authors discuss tree nutrition and outline managemental operations necessary for maintaining Pennsylvania orchards in a thrifty, productive condition.

Air-cooled storage for apples, R. E. Marshall (*Michigan Sta. Spec. Bul. 146 (1925), pp. 3–54, figs. 31*).—Based on studies conducted in several nonrefrigerated apple storage houses, extended information is presented upon the construction, equipment, and operation of such structures, laying particular emphasis on the necessity of thorough insulation and provision for adequate ventilation.

Records taken in commercial storages showed that, while there is a tendency for storage temperatures during the fall season to fluctuate with outdoor changes, the mean storage temperature is from 3 to 6° F. lower than the mean daily outdoor temperature. Occasional wide variations are believed to be due to the opening of the doors for incoming fruit. The data showed that temperatures comparable to those attained in refrigerated houses can not be expected in air-cooled houses until late November or early December.

By placing a sensitive anemometer in different parts of a rectangular air outlet flue, it was found that the velocity of the air was greatest in the center and least in the corners of the flue. Comparing the movement of air in flues of different sizes, it was found that in almost every case decreasing the size of the outlet increased the velocity of the air. Computations of the comparative amount of air passing through a single flue and that passing through two flues having an aggregate area equal to that of the single flue showed considerably greater movement for the two flues. Varying the number of outlets of the same dimensions, it was found that the volume of air passing through a storage house is directly proportionate to the number of outlets employed. Cutting down the size of the intakes to one-half materially reduced the movement of air through the outlets. A reduction of air movement following a reduction in the size of the outlets with intakes wide open indicated the importance of having outlets sufficiently large to permit free movement of air. An increase in air movement following the opening of doors was not directly proportionate to the increase in intake area, but showed a substantial difference in favor of doors as a supplement to the intake openings.

Records showed that the velocity of outside air has a very direct effect on air movement in the storage house, and tests of air movement under various wind conditions indicated the importance of operating the ventilators in part at least according to the direction and velocity of the outside wind. Temperature records taken in connection with air movement records indicated that from 41 to 73 cu. ft. of air is required to lower the temperature of a bushel of apples 1° when the air is 3 to 9° cooler than the fruit.

Preliminary studies relating to the harvesting and canning of sweet cherries, H. Hartman (*Oregon Sta. Circ. 61 (1925), pp. 4–22, figs. 7*).—A report upon studies, conducted in 1924, of various factors concerned in the development of quality in sweet cherries.

Observations upon Napoleon and Lambert fruits picked at frequent intervals during the ripening period showed that the time of picking has a material effect on firmness, sugar and acid content, size, color, and dessert and keeping qualities. Prematurely harvested cherries were undersized, low in sugar, high in acid, and lost weight rapidly in storage. Furthermore, when canned the prematurely picked fruits resulted in a product soft in texture, low in flavor, considerably shriveled, and requiring excessive quantities of sugar in

order to develop quality. Sweet cherries failed to improve in quality after picking, the reverse apparently being true.

The pressure test, found quite satisfactory with pears, did not prove a reliable index to maturity. It is believed, however, that a maturity test based on the specific gravity of the juice may prove worth while.

The Madonna lily, D. GRIFFITHS (*U. S. Dept. Agr. Bul. 1331* (*1925*), *pp. 18, pls. 2*).—Herein is presented general information concerning the production of the Madonna lily, taking into consideration such points as the introduction of the plant in the United States, propagation, soils, planting practices, culture, climatic preferences, grading, storing, etc.

Bamboos: Their culture and uses in the United States, B. T. GALLOWAY (*U. S. Dept. Agr. Bul. 1329* (*1925*), *pp. 46, pls. 14*).—Herein is presented general information concerning the introduction of the bamboo into the United States, the botanical characters and relationships of the plants, cultural types, practical and ornamental uses, propagation, culture, and the control of insect (by W. Middleton) and fungus pests.

FORESTRY

Wind and exposure as limiting factors in the establishment of forest plantations, H. C. BELYEA (*Ecology, 6* (*1925*), *No. 3, pp. 238–240*).—Observations in a plantation of white and red pine established in 1920 on an exposed site on the Syracuse University grounds indicated that on the same site and under similar conditions the red pine is more resistant to wind desiccation injuries than is the white pine. Records taken in April, 1923, following an extended period of heavy, cold, dry winds in February and early March, show 34.5 per cent of the red and 12.7 per cent of the white pines in a condition denoting ability to survive. So serious was the wind injury that the author believes it highly probable that wind may in some cases render impossible the growing of certain tree species upon exposed sites, especially where the soil is deficient in moisture.

Progress report of forest research work in India for the year 1923–24 (*Forest Research Inst., Dehra Dun, Prog. Rpt., 1923–24, pp.* [*3*]+*107, pls. 8, fig. 1*).—Prepared in the usual manner (E. S. R., 51, p. 649), this progress report, which includes the administration report of the Forest Research Institute at Dehra Dun, offers in a summarized form a review of the experimental and administrative activities throughout the various Provinces during the period covered.

Report on the forest administration of the Central Provinces for the year 1923–24, H. A. FARRINGTON (*Cent. Provs.* [*India*] *Forest Admin. Rpt. 1923–24,* [*pt. 1*], *pp.* [7]+*29*+*10;* [*pt.* 2], *pp. LXXXIII*).—This report, again presented in the form of two pamphlets (E. S. R., 52, p. 644), contains general information on forest management, silviculture, etc., and tabulated data relating to changes in area, lumber output, revenues, expenditures, etc.

Annual progress report upon State forest administration in South Australia for the year 1923–24, E. JULIUS (*So. Aust. State Forest Admin. Ann. Rpt., 1923–24, pp. 11, pls. 8*).—The usual administrative report (E. S. R., 50, p. 545).

DISEASES OF PLANTS

[Report of the Connecticut State Station department of] botany, G. P. CLINTON (*Connecticut State Sta. Bul. 264* (*1925*), *pp. 207–210*).—The author claims, from a study of the root rot of tobacco due to *Thielavia basicola*, that attempts to determine the parasitism of the ascospore strains associated with

this disease have so far yielded negative results. Although perithecia were found embedded in the roots of tobacco, pea, and violet, in these cases they were always associated with the conidium-chlamydospore stages.

In the report on disease control an account is given of comparisons of spraying and dusting on apples and peaches. Spraying uniformly gave better control, although in a dry season a test of spray and dust combinations gave results that seem to indicate that dust may be used in the control of apple troubles.

For celery blights homemade 4-4-50 Bordeaux mixture was compared with Niagara Sulfodust and Niagara D25 Copper Dust. The control and yields were in favor of the use of the Bordeaux mixture.

A brief account is given of the control of root rot of sweet corn by seed selection. This experiment was begun in 1920, and a composite sample of seed selected from the best lines was planted in comparison with unselected seed of the same strain and unselected seed of the same variety but from a different seed source. The selected seed gave a better stand and more even growth especially early in the season. The number of diseased ears did not differ greatly, but the yields of the selected seed were much greater. The selected seed has also shown a steady increase in the average percentage of disease-free ears, determined by germination tests.

In a comparison of sprays and dusts on potatoes copper dust was compared with a 4-4-50 Bordeaux mixture, and while there was no blight in the three years covered by the experiment, each season the sprayed plat gave a better yield than the dusted one. The sprayed vines showed less injury from tipburn and flea beetles and lived longer than those in the dusted and check plats.

[Report of the Missouri Station department of] botany (*Missouri Sta. Bul. 228 (1925), pp. 42, 43*).—In a previous publication (E. S. R., 51, p. 51) the possibility of controlling tomato wilt by rendering the soil unsuitable to the growth of *Fusarium lycopersici* was suggested by I. T. Scott. The same investigator gives an account of further experiments in which lime was added to soils in quantities sufficient to change their H-ion concentrations materially. Tomato plants of a susceptible variety were set in the soils after their roots had been thoroughly inoculated with a spore suspension of the fungus. Marked wilting was noticed after 30 days, and all plats showed 100 per cent infection after 60 days. Soil samples taken 3 in. below the surface showed pH values practically identical with the untreated soil, and samples taken from roots of wilted plants showed a reaction very near that of the original soil.

In continuation of previous investigations (E. S. R., 52, p. 124) W. J. Robbins and Scott give an account of the experiments to test the analogy between plant tissues and an ampholyte with a definite isoelectric point. Potato tuber tissue, root tips of soy beans, and mycelial mats of *F. lycopersici*, *Gibberella saubinetii*, and *F. oxysporum* affected the reaction of dilute buffer solutions by making acid ones more alkaline and alkaline ones more acid the same as is done by an ampholyte of definite isoelectric point. Potato tuber tissue was found to respond very similarly to an ampholyte whose isoelectric point is pH 6.2, soy bean root tissue 6.2-6.4, and the mycelium of *F. lycopersici* 5.5, *G. saubinetii* near 6.2, and *F. oxysporum* 4.9. The difference in the points of these nearly related fungi is believed to suggest the possibility of using the isoelectric point as a taxonomic character.

Experiments additional to those reported by Robbins and W. E. Maneval (E. S. R., 53, p. 123) are said to indicate that the high lime content in the culture medium used in their previous experiments was responsible for the cessation of the growth of excised root tips. By reducing the calcium con-

tent in the Pfeffer's solution excised root tips were grown through 6 periods of transfer, while under the conditions of the earlier experiments they ceased to grow during the third period. The authors report having found that growth of excised root tips in nutrient solutions containing glucose is favored by autolized yeast and peptone, light, and a reduction in the calcium content of the solution.

[Plant disease investigations of the Wisconsin Station] (*Wisconsin Sta. Bul. 373 (1925), pp. 5–16, figs. 5*).—In the course of a study of mosaic diseases J. Johnson found that by inoculating healthy tobacco leaves with an extract from apparently healthy potatoes a form of mosaic was produced that differed from the typical tobacco mosaic. The new disease is said to become more virulent when passed through several generations of tobacco plants. The question is raised as to whether the disease was a latent form of virus disease in the potato that appeared in tobacco or was caused by the actual transfer of protoplasmic particles that continued to develop in the tobacco plant and finally brought about a pathological conditon.

The results of experiments by the same investigator are said to show the practicability of producing mosaic-free seed potatoes by the use of the index method of testing. The indexed tubers should be germinated under temperature conditions favorable for the expression of the disease, temperatures below 75° F. being suitable for this purpose. By combining index testing and roguing in the field about 350 bu. of mosaic-free seed tubers were produced in 1924.

Black fire, a bacterial disease of tobacco, is said to have been prevalent in Wisconsin in 1924, having been especially common in seed beds. It is reported that should the disease become serious treating seed with silver nitrate and sterilization of seed bed material may become necessary.

A survey of pea fields by M. B. Linford and F. R. Jones, working in cooperation with L. R. Jones and R. E. Vaughan, showed the wide distribution of root rot. No evidence was found to indicate that any soil type was free from disease, but soils that were wet from poor drainage seemed to be favorable for the development of the rot. Rotations are believed to offer a means of control.

Studies in grain disease control by J. G. Dickson are said to show that temperature and moisture in the growing season are important factors in connection with seed treatment. Barley stripe was more effectively controlled in 1924 by treatments with cresol-mercury and phenol-mercury compounds than by formaldehyde or copper sulfate. For the control of oat smut formaldehyde gave the best results, but there was some injury to germination. Copper carbonate was used with fair degree of success, and there was no seedling injury. Grain rust epidemics were traced to barberry bushes in several instances. Gathering seed corn before frost and artificially drying it to a moisture content of 12 per cent is said to have given a perfect stand free from corn root rot as compared with a stand of 40 per cent where uncured crib corn was planted.

Investigations by A. J. Riker and G. W. Keitt are said to have shown that the bacteria of crown gall develop between the cells of the host and not within them. This raises the question of the possibility of excising crown galls without the necessity of discarding the host plants.

In continuation of cabbage disease studies especial attention has been given by J. C. Walker, F. L. Wellman, and L. R. Jones to the production of wilt-resistant types of early cabbage. Progress has been greatly hastened by seed production during the winter through the growing of mother plants in greenhouses. Steeping cabbage seed for 30 minutes in water at a temperature of 122° is said to have given excellent results in the control of black rot and blackleg of cabbage.

From a study of spore discharge from old apple leaves affected with scab it was found that infection took place in one variety 20 days before the buds were in the pink stage, thus emphasizing the necessity of prepink spraying. Further observations on cherry leaf spot are said to have shown that infection is caused by spores discharged about June 15, and that in a cool, moist season the spraying program usually employed will hold the disease in check.

Studies on the effects of fungicides and insecticides on plants (*New Hampshire Sta. Bul. 216 (1925), pp. 8, 9*).—Experiments were conducted by O. Butler to determine the effect of the composition of Bordeaux mixture on injury to plants. It was found that, in general, beans, tomatoes, and radishes were liable to injury from the use of an alkaline Bordeaux mixture. The injury when produced occurred only on the young tender leaves and was not increased when the sprayed plants were wet with dew during the night following the application of the mixture. So far as the experiments have been carried out, it appears that in the case of plants not sensitive to copper an alkaline Bordeaux mixture may cause injury to the young leaves when a neutral one will not. In the case of plants sensitive to copper, as the peach, alkaline fungicides proved more injurious to young foliage than neutral mixtures.

W. L. Doran carried on experiments to determine the effect on spores of the apple scab fungus of adding arsenious oxide, lead arsenate, and calcium arsenate to lime-sulfur solutions. It is reported that lead arsenate, through its decomposition, and arsenious oxide increased the toxicity of the solutions, but the addition of calcium arsenate only slightly decreased the percentage of spore germination. The addition of copper sulfate, even in small quantities, to lime-sulfur solution greatly increased the toxicity of the fungicide so far as shown by spore germinations.

Factors influencing lodging in corn, B. Koehler, G. H. Dungan, and J. R. Holbert (*Illinois Sta. Bul. 266 (1925), pp. 311–334, 369, 371, figs. 7*).—A report is given of a study of the effect of corn diseases on lodging, the experiments being conducted with seed infections and seed inoculations. All the infections and inoculations resulted in decreased vigor and yield, but all of them did not increase the amount of lodging.

Increases in the percentage of leaning stalks occurred when seed was infected with *Diplodia zeae*, when starchy seed susceptible to scutellum rot was used, or when the seed was naturally infected or artificially inoculated with *Gibberella saubinetii*. No significant increases in the percentage of leaning plants occurred when the seed was infected with *Fusarium moniliforme* or *Cephalosporium acremonium*, and increases were doubtful when horny seed susceptible to scutellum rot was used.

Increases in percentage of broken stalks due to seed infection occurred only when seed was infected with *C. acremonium* or when starchy seed susceptible to scutellum rot was used.

Commercial strains of corn, even when practically free from seed infection, varied considerably in respect to lodging.

Cabbage seed selection for disease resistance (*Missouri Sta. Bul. 228 (1925), pp. 61, 62*).—Tests of varieties and strains of cabbage resistant to yellows caused by *Fusarium conglutinans* are said by J. T. Quinn to have shown infections from 3 to 27 per cent, while nonresistant commercial varieties showed infections as high as 87 per cent. The Wisconsin All Season was the most resistant of all the varieties tested.

The smut disease of onions, P. J. Anderson and A. V. Osmun (*Massachusetts Sta. Bul. 221 (1924), pp. 29, pls. 4*).—After giving an account of the origin,

history, and economic importance of the disease of onions caused by *Urocystis cepulae*, and the life history of the causal organism, the authors report upon six years' experiments for the control of onion smut.

It is claimed that onion smut can be controlled by the use of formaldehyde applied as a drip in the furrow at the time of seeding. Within fairly wide limits, the strength of the solution was not found to be as important as the actual amount of formaldehyde applied per unit of distance of row. Some injury to germination was found in all cases where the fungicide was used in sufficient strength to destroy the fungus, the amount of injury being increased by the dryness of the soil.

After testing many strengths of solution the authors recommend the use in dry soil of 1 gal. of formaldehyde to 50 gal. of water applied to 5,000 ft. of row. If the soil is fairly moist a 1–50–4,000 formula is recommended, and if it is wet a 1–50–3,000 formula.

A number of other fungicides were tested in a preliminary way, and some of the new preparations gave very promising control.

In connection with their experiments the authors devised and describe a tank which is attached to the seed drill and distributes the liquid evenly and in any quantity that is desired.

Effect of spray pressure and number of nozzles on late blight of potatoes, O. BUTLER (*New Hampshire Sta. Circ. 24 (1925), pp. 4, figs. 4*).—In a previous publication (E. S. R., 47, p. 448), the author showed that there was twice as great protection to potatoes when sprayed with Bordeaux mixture applied with 180 lbs. pressure as when only 90 lbs. pressure was employed. Additional experiments were conducted to determine the effect of pressure on the control of late blight and the effect of the number of nozzles used per row, the object being to determine the best method of spraying with traction machines of small capacity.

The results show that 90 lbs. pressure did not give as satisfactory control of late blight as did 180 lbs. pressure. The position of the nozzles and the size of nozzle caps were found to be important factors in blight control. To accomplish the best results the nozzles over the center of the row should be directed upon it perpendicularly to the line of motion, or at an acute angle, but never at an obtuse angle to it. The nozzle spraying in from the side should be set at an angle of 45° with the vertical and should face at right angles to the line of motion. Nozzle caps with an opening of 0.055 in. diameter are preferred to caps with larger openings. If the sprayer is only capable of applying a mixture under a pressure of 90 lbs., two nozzles should be used and the spray machine should go forth and back over the rows. If the sprayer will maintain a pressure of 180 lbs., three nozzles may be used, and going over the rows only once will suffice.

The spindle-tuber disease, one cause of "run-out" seed potatoes, H. O. WERNER (*Nebraska Sta. Bul. 207 (1925), pp. 21, figs. 14*).—A popular account is given of the spindle tuber disease, which is said to be one of the most prevalent potato diseases occurring in all parts of Nebraska. The disease is said to be carried over in the seed tubers, and under certain conditions it spreads very rapidly. Spindle tuber is said to spread more rapidly in irrigated than in dry land fields, and in eastern Nebraska it appeared to develop less extensively in straw mulched than in cultivated fields. Late planting was found to exert a slightly retarding effect on the increase of the disease, and early harvesting was somewhat less effective. The selection of good type potatoes from a severely infected strain is claimed to be without value in controlling the disease, but early and frequent roguing of lots containing a low percentage of the disease was an effective control measure.

The author recommends for the control of spindle tuber the selection of a good strain of seed potatoes as free as possible from this and other diseases, the selection of the best type tubers for planting in a seed plat, isolation of the seed plat, roguing severely and frequently, and the selection of tubers of the best type produced in this plat for use in the seed plat the following year.

[Wilt resistant tomato varieties] (*California Sta. Rpt. 1924, p. 46*).—An intensive study of tomato varieties has shown that the Norton variety is not only resistant to wilt caused by *Fusarium lycopersici* but is also a desirable commercial form. The Glove variety was also found to be resistant and is a useful early variety with possibilities as a shipper.

Tomato seed selection for disease resistance (*Missouri Sta. Bul. 228 (1925), pp. 59, 60*).—J. T. Quinn reports 5 years' experiments with 40 different strains and varieties of tomatoes, some of the resistant strains of which are said to have given increased yields as high as 8 tons per acre over nonresistant commercial varieties.

Experiments on the control of apple scab and black rot and spray injury in 1924, W. L. Doran (*Massachusetts Sta. Bul. 222 (1925), pp. 10*).—Experiments are briefly reported on attempts to control apple scab caused by *Venturia inaequalis* and black rot due to *Physalospora cydoniae*. The primary infection of the leaves was prevented equally well by lime sulfur, Bordeaux mixture, and dry-mix sulfur lime, but less effectively by dusting with sulfur.

On two McIntosh plats sprayed with lime sulfur four times, there were 1.2 and 0.2 per cent of scabby apples as compared with 69.4 and 81 per cent, respectively, on unsprayed trees. A fifth application did not increase the protection against scab. Dry-mix sulfur lime did not control scab on McIntosh as completely as lime sulfur. The substitution of Bordeaux mixture for lime sulfur for the preblossom applications gave practically perfect protection against scab, although the use of lime sulfur for all applications gave protection that was almost as good. Sulfur dust is said to have given satisfactory control for scab. In McIntosh orchards 3.5 per cent of scabby apples occurred on trees dusted with sulfur as compared with 65 per cent on check trees. The addition of calcium caseinate spreader to lime sulfur-lead arsenate spray did not result in increased protection against scab.

Lime sulfur-lead arsenate spray was found to cause foliage injury, and this was not prevented by the addition of a calcium caseinate spreader. Leaves dusted with sulfur or sprayed with dry-mix sulfur lime were not visibly injured. The addition of calcium caseinate spreader to lime sulfur-lead arsenate spray resulted in a reduction of about 50 per cent in the amount of russeted fruits on Gravensteins. A larger percentage of russeted apples occurred on plats on which Bordeaux mixture or copper dust was used for preblossom applications than where the trees were sprayed with lime sulfur or dusted with sulfur at all applications.

In the Baldwin orchard, there were three times as many leaves with frogeye leaf spot on check trees as on those dusted with sulfur. In this orchard, 7.2 per cent of the fruit on the check trees became infected with black rot, while the disease was present on only 0.9 per cent of the fruit dusted with sulfur.

[Control of sooty mold and scab of apples in New Hampshire] (*New Hampshire Sta. Bul. 216 (1925), pp. 14-16*).—In experiments for the control of these diseases, O. Butler found that a 2-2-50 Bordeaux mixture gave satisfactory control, and it was somewhat less injurious to the apple than a 3-4-50 Bordeaux mixture. Four sprayings with lime sulfur did not give as satisfactory control as two sprayings with Bordeaux mixture. It is claimed that the most satisfactory schedules were Bordeaux mixture for the pre-

pink and calyx followed by lime sulfur 14 days after the calyx spray, or Bordeaux mixture for the prepink and pink and lime sulfur for the calyx spray. The latter schedule is preferred, since Bordeaux mixture applied to the calyx russets the fruit and should not be used except under necessity.

For the control of apple scab, when Bordeaux mixture was used on Baldwin apples for the prepink, pink, and calyx sprays, lime sulfur applied 14 days after the calyx spray was of no value, but when lime sulfur was used as the prepink, pink, and calyx sprays, an application of the same fungicide 14 days after the calyx application produced marked results. In the experiments on the McIntosh apples, the control obtained in 1921 and 1922 by the use of lime sulfur was not so good as that given by Bordeaux mixture, but in 1923 under a less severe incidence of scab the protection was as satisfactory as that given by Bordeaux mixture.

Control of apple scab, O. BUTLER (*New Hampshire Sta. Circ. 25 (1925), pp. 8*).—For the control of apple scab the author recommends in very scabby orchards a prepink, pink, and calyx spray of Bordeaux mixture 2–2–50, followed 14 days after the calyx spray with lime sulfur 1–50. Where scab is less severe susceptible varieties, such as McIntosh, should receive lime sulfur 1–50 for prepink, pink, and calyx sprays. In more resistant varieties, as Baldwin, the pink spray can be omitted. The addition of 1.5 lbs. of calcium arsenate to the fungicide is recommended for the prepink and calyx sprays as a protection against insects.

Treatment of apple canker diseases (*Missouri Sta. Bul. 228 (1925), p. 59*).—A report is given by H. G. Swartwout of tests of white-lead paint, water glass, tanglefoot, and a modified grafting wax as coverings of wounds from pruning or cutting out cankers on apple trees. The wounds, which were of considerable size, were sterilized with a solution of copper sulfate, 1 lb. to 1 gal. of water, before the coverings were applied.

Observations made a year later showed the cambium to be dead on most of the treated cankers, and on many of the pruning wounds to a distance of 0.25 in. to 1 in. beyond the edge of the original wound. This is believed to have been caused by the strong solution of copper sulfate. Some of the treated cankers showed further progress of the disease above and below the areas treated with all materials. The greatest spread occurred with those treated with white-lead paint, followed by those treated with sodium silicate, grafting wax, and tanglefoot. So far as covering wounds is concerned, all those which were covered with tanglefoot were perfectly protected. Grafting wax made a good covering where it could be made to adhere to the moist surface of the wounds. The white-lead paint nearly all scaled off at the end of the year, and the wood was badly checked, indicating that if this material were used two paintings a year would be necessary. Water glass gave no protection.

[Winter injury to apples in New Hampshire] (*New Hampshire Sta. Bul. 216 (1925), pp. 12, 13*).—Since reporting on the relation of the conditions of freezing to injury of seedling roots of apples (E. S. R., 52, p. 218), Potter has undertaken further investigations along this line. In order to test some of the facts brought out in the previous work, trees have been propagated on Hibernal stock, which proved to be the most resistant to cold. Another phase of the investigation is concerned with the nature of the injury which results from the exposure of the roots to low temperature. Microscopic examinations of the development of roots after they are injured by frost have shown that in the normal roots the rows of cells in the meristematic region are perfectly uniform and regular, while roots which started growth after

being frozen showed these cells to be much distorted and arranged in irregular groups.

[Pear blight treatment] (*California Sta. Rpt. 1924, p. 51*).—A description is given of a new method of treating the wounds of trees in connection with the treatment of pear blight. The treatment consists of the use of equal quantities of mercuric bichloride and cyanide of mercury dissolved in water and glycerin. This is said to have proved 90 per cent efficient, even in the hands of growers who had no special skill in administering the treatment. The treatment is based on the fact, discovered during the course of the investigation, that the bacteria causing the blight at first work in the outer bark rather than in the cambium as had previously been supposed.

Cherry leaf-spot: Residual effects and control, W. C. Dutton and H. M. Wells (*Michigan Sta. Spec. Bul. 147 (1925), pp. 3–15*).—After a brief description of the leaf spot of cherries due to *Coccomyces hiemalis*, the authors give an account of investigations on its residual effects and methods of control. Heavy, premature defoliation due to the fungus is said to cause significant reductions in yield and growth. Trees which had been defoliated in the previous year produced relatively few blossoms, and these were small and opened slowly. Fewer cherries ripened, they were smaller, and the total production per spur was reduced seriously. The vigor of the defoliated trees was lowered as was shown by reduced wood growth, by smaller leaves, and by reduction in the formation of new spurs.

For the control of leaf spot the comparative value of a number of spraying and dusting materials was investigated. The authors claim that Pyrox can not be recommended for use on cherries because of the serious foliage injury which may follow its use. Colloidal sulfur did not cause any foliage injury but gave unsatisfactory control. Sulfur and copper dusts caused no foliage injury or serious reduction in the size of the fruit, but they did not give satisfactory control of leaf spot in seasons when conditions were favorable for its development. Bordeaux mixture proved consistently satisfactory for the control of leaf spot, but it frequently caused severe foliage injury and reduction in the size of the fruit. Lime sulfur gave satisfactory control, did not cause foliage injury of any consequence, and it did not seriously reduce the size of the fruit. Changing from lime sulfur to Bordeaux mixture or vice versa during the same season was found to cause serious foliage injury, and such a practice is considered unsafe.

Based on results of their experiments, the authors recommend that liquid lime sulfur, diluted at the rate of 3 gal. in 100, should be used in Michigan for the control of leaf spot on sour cherries. Four applications should be made, the first just after the petals have dropped, the second and third at two-week intervals, and the last just after harvest.

Fruit-rotting Sclerotinias.—II, The American brown-rot fungi, W. N. Ezekiel (*Maryland Sta. Bul. 271 (1924), pp. 87–142, figs. 22*).—Continuing earlier work (E. S. R., 50, p. 842), comparative studies of a large number of single-spore strains of Sclerotinia have led the author to the conclusion that the common American brown-rot organism is distinct from *S. cinerea* of Europe. A number of differentiating characters have been recognized, and it is considered advisable to raise the form described by H. Wormald as *S. cinerea americana* to specific rank under the name *S. americana*. Six strains or varieties of the species are recognized. The author claims that there is no authentic record of the occurrence of *S. fructigena* in the United States. *S. cinerea pruni* was recognized from California.

[Investigations by the California Station in] plant pathology (*California 1924, pp. 49, 50*).—The soft rot of the Calimyrna fig has been found

to be a fungus infection transmitted entirely by the Blastophaga insect, which is indispensable for the pollination of this variety of fig. Three years' spraying experiments have shown the possibility of the control of brown rot of the apricot (E. S. R., 52, p. 848).

Plant pathology [at the California Citrus Experiment Station] (*California Sta. Rpt. 1924, p. 40*).—Investigations carried on during the year are said to have indicated that shellbark of lemons is probably caused by *Phomopsis californica;* that *Prunus mume* is resistant to crown gall, and it may prove to be a satisfactory stock for apricots and possibly for other stone fruits; that the crown rot of the southern black walnut is probably of fungus origin, and the northern black walnut is also susceptible to the disease; that internal decline or membranous stain of lemons is due at least in part to the withdrawal of water from the fruits during hot, dry periods when transpiration is so great that the roots are unable to supply all the water needed; and that thorough scraping of areas of orange trees affected with psorosis and disinfecting the wounds will check the disease in its early stages.

[A possible cause of mottle leaf, little leaf, etc., of citrus] (*California Sta. Rpt. 1924, p. 37*).—A study of replaceable bases is said to have indicated a possible cause of such physiological diseases of citrus as little leaf, mottle leaf, etc. The harmful effects of a low amount of calcium were studied, and conditions of citrus foliage resembling mottle leaf were obtained when low calcium was accompanied by larger proportions of potassium.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report on entomological work at the California Station] (*California Sta. Rpt. 1924, pp. 37–39, 42, 43*).—This consists of brief statements of entomological work under way. In experimental work with calcium cyanide it has been found that in fumigation of citrus trees it is effective on insects but more injurious to the trees under certain climatic conditions, that when spread on the ground gas is given off in sufficient quantities to kill the scales on citrus if 25 per cent more of the material is used, that it is less satisfactory than paradichlorobenzene when used against peach tree borer, that good results were secured in treating soil for nematodes where 600 lbs. to the acre was used, and that its use against adults of the grape leafhopper in the early spring gives promising results. Of several species of black scale parasites imported from South Africa, propagated, and released in orchards in California, *Coccophagus modestus* Silv. and *C. trifasciatus* Comp. are the most promising.

In the continued intensive study of curly leaf of sugar beets, it has been found that noninfective beet leafhoppers when allowed to feed on curly leaf beets transmitted the disease at the end of two hours. It was also found that 17 per cent of the spring brood adults collected in the foothills of Little Panoche Valley transmitted curly leaf to sugar beets. One per cent of the winter host plants of the beet leafhopper, namely, *Erodium cicutarium* and *E. moschatum*, harbored curly leaf under natural conditions in the foothills of this region. In a continued study of weeds susceptible to curly leaf, it has been found that 11 species of plants of the family Chenopodiaceae, serving as food and breeding plants of the beet leafhopper, are susceptible to curly leaf.

In studies of methods of control of the suckered roundworm of poultry, it has been demonstrated that tobacco dusts containing 1.5 to 2 per cent of nicotine mixed in the proportions of 2 per cent of the dry mash by weight and fed continuously for from one to four weeks remove practically 100 per cent of the intestinal worms (*Ascaridia perspicillum*) and approximately 80 per cent of the cecum worms (*Heterakis vesicularis*).

Reference is again made to flooding for control of the garden centipede *Scutigerella immaculata* (Newp.) (E. S. R., 52, p. 56).

Twenty-fourth report of the State entomologist of Connecticut, 1924, W. E. BRITTON (*Connecticut State Sta. Bul. 265 (1925), pp. 225–344, pls. 20, figs. 9*).—Entomological features of the year 1924, first referred to (pp. 230–238), are followed by reports of the inspection of nurseries (pp. 238–244), of imported nursery stock (pp. 244, 245), and of apiaries (pp. 246–254).

A report of Gipsy Moth Work, by W. E. Britton and J. T. Ashworth (pp. 254–276) is next presented. There was no serious spread during the year, though a few additional towns were found infested. An account of The European Corn Borer in Connecticut is given by W. E. Britton and M. P. Zappe (pp. 277–282). Further infestations were discovered in six towns along the coast. The findings in laboratory examinations for insects made of twigs from 18 apple orchards during March and April are reported upon in tabular form (pp. 283–286).

Dusting v. spraying during the season of 1924 is reported upon by M. P. Zappe and E. M. Stoddard (pp. 286–292). On the McIntosh apple, chiefly due to scab control, the liquid spray was from 10 to 30 per cent better than any of the other treatments, with 90–10 sulfur-arsenate dust a close second. The application of nicotine in the spray gave very good control of leafhoppers, but the one application of nicotine dust gave in most cases better control of aphids than did the three applications of nicotine spray. On Baldwin, Greening, and Gravenstein apples, aphids were the controlling factor in the production of perfect fruit. A Summary of Five Years' Work on Spraying and Dusting is given by M. P. Zappe and E. M. Stoddard (pp. 293, 294), in the preparation of which 564,675 apples, chiefly of the varieties McIntosh, Greening, Gravenstein, and Baldwin, in four orchards in the vicinity of New Haven were scored. It appears from the figures obtained that dusting is practically as good as spraying for the control of red bug, curculio, codling moth, and other chewing insects, but in the control of fungi there is a wide variation in favor of spraying. Aphids have not been controlled by either treatment.

Tests of Insecticides for the Control of the Asiatic Beetle (*Anomala orientalis* Waterhouse), by M. P. Zappe and P. Garman, in which calcium cyanide, sodium cyanide, and carbon disulphide emulsion were used, are reported upon (pp. 294–299). Studies of the Habits and Control of the Oriental Peach Moth in 1924 (pp. 299–303), Effect of Various Insecticides on the Eggs of the European Red Mite, *Paratetranychus pilosus* C. & F. (pp. 304, 305), The Alcohol-formalin Solution for Control of American Foul Brood (pp. 305–307), and The Egg of the Blueberry Spittle Bug, *Clastoptera proteus* Fitch (pp. 307, 308), are all reported upon by P. Garman. Brief accounts are also given of The Woolly Aphid of Apple and Elm (pp. 308–311); The Lime Tree Winter Moth, *Erannis tiliaria* Harris (pp. 311–314); Substances Attractive to the Cabbage Maggot Fly, by R. B. Friend (pp. 314–318); Experiences in Dusting to Kill Pea Aphid, Cabbage Aphid, and Onion Thrips, by R. B. Friend and B. H. Walden (pp. 319, 320); Hints on Photographing Insects, by B. H. Walden (pp. 321–331); and Mosquito Control Work in Connecticut, Season of 1924, by R. C. Botsford (pp. 331–335). The report concludes with Notes on Miscellaneous Insects (pp. 336–342).

Entomology [at the Missouri Station, 1923–24], L. HASEMAN ET AL. (*Missouri Sta. Bul. 228 (1925), pp. 47–52*).—In continuation of control work by Haseman and K. C. Sullivan with the striped and spotted cucumber beetles (E. S. R., 51, p. 759), gypsum, lime, and cyanide C dust were tested. An application of cyanide C dust, containing 25 per cent cyanide, by means of a small hand duster, burned the plants severely and only temporarily disabled the insects. Naphthalene moth balls had little repellent effect, and 4 per cent

nicotine dust burned the leaves slightly and apparently did the beetles no permanent harm. The lime plus 10 per cent calcium arsenate protected the plants as long as they were covered with the material, and there was no burning. Plain gypsum protected the plants, and there was no burning, while gypsum plus 5 per cent calcium arsenate gave very satisfactory results.

There are said to have been few or no Hessian flies in the wheat during the year except in the northwestern part of the State, where there was slight infestation after the fly-free date but not enough to cause any serious loss. It is stated that a very large percentage of the wheat sown in the State is now sown after the fly-free date, with the result that very little damage is done even in bad fly years.

In control work with the codling moth, by Haseman, Sullivan, and N. Turner, trees were sprayed with arsenate of lead solutions, using 100, 175, and 200 lbs. pressure with a Bordeaux nozzle, a disk nozzle, and a spray gun. The results of analyses made of calyx cups and tips after spraying at the different pressures are reported in tabular form. In a few cases low-pressure treatments left an insufficient amount of arsenate of lead to kill the larvae.

The results of work with the chinch bug, by Haseman and Sullivan, substantiated the results of the previous year so far as relates to the value of calcium cyanide as a barrier. See also an earlier note (E. S. R., 51, p. 359).

In control work with the San Jose scale, by Haseman, Sullivan, Turner, and G. L. Davis, it was found that the commercial soap and oil emulsion gave the best results, with Scalecide a close second. However, some very serious injury to some of the trees was evidently caused by the commercial oil emulsion. Reference is made to the effect of oil spray on apple aphids, particularly the apple grain aphid, an account of which has been previously noted (E. S. R., 52, p. 658).

[Work in economic entomology at the New Hampshire Station] (*New Hampshire Sta. Bul. 216 (1925), pp. 7, 8, 19, 20*).—Studies of the life history and habits of the European corn borer, commenced in the spring of 1922, by W. C. O'Kane and P. R. Lowry, briefly reported upon, show it to pass through two complete generations in New Hampshire. A brief summary of the studies of its life history is presented. Thus far the species appears to be relatively free from attack by parasitic enemies in the State.

Observations of the stalk borer, which has been relatively abundant in the State for a number of seasons, indicate the existence of at least seven larval instars. The number of eggs deposited by a single moth ranged from approximately 100 to a maximum of nearly 500. The first pupa was found August 16 and the last September 3. The pupal period ranged from 28 to 36 days. The first adult emerged September 18 and the last September 30. Of the larvae collected in the field 11.76 per cent were parasitized by tachinids.

Collections and records of black flies by O'Kane, extending over several seasons, indicate that there are several species not hitherto recorded from the State, including one species new to science.

[Work with economic insects in Wisconsin] (*Wisconsin Sta. Bul. 373 (1925), pp. 18–25, figs. 3*).—A successful campaign against grasshoppers, in charge of A. A. Granovsky, is first dealt with, a report upon which has been noted (E. S. R., 53, p. 358). Reference is next made to control work with the pea louse and the satisfactory results obtained from the use of the aphidozer constructed by Dudley and Searls in 1923 (E. S. R., 51, p. 453). Experimental work has shown that the machine sweeps from 80 to 90 per cent of the aphids from the vines, yields in experimental plats being increased from 20 to 107 per cent over the check plat. Observations made of natural enemies of the pea aphid and wintering work with bees are also mentioned.

A method of computing the effectiveness of an insecticide, W. S. ABBOTT (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 265–267*).—A contribution from the U. S. D. A. Bureau of Entomology.

The distribution of an insecticide made visible, A. C. MORGAN and R. G. MEWBORNE (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 299–302*).—A method applicable to all dusts of whatever character and also to sprays is described.

Electric-charges of arsenical particles, W. MOORE (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 282–285*).—It is pointed out that the common arsenical insecticides may be so manufactured that they will contain an adsorbed positive ion. Such insecticides show great adherence to plants, resisting the washing effects of rain and dew. It is also possible to impart an electrostatic charge to the insecticide particle at the time of dusting, which aids in the distribution of the insecticide over the plant.

The fatty acids as contact insecticides, E. H. SIEGLER and C. H. POPENOE (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 292–299*).—This is an account of investigations of the fatty acids, a detailed report of which has been noted (E. S. R., 52, p. 655).

An investigation of sulfur as an insecticide, A. HARTZELL and F. H. LATHROP (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 267–279, figs. 2*).—The toxicity of sulfur and some of its compounds was tested under laboratory and field conditions. Atmospheres containing the volatile products of lime sulfur were found to produce lethal effects on San Jose scale (*Aspidiotus perniciosus*), especially on the young. Tests on the covers of this species indicate that they are very slightly, if at all, soluble in lime sulfur and the common wax solvents such as benzene, xylene, and turpentine.

During the progress of the investigation three new insecticides were invented. (1) Carbon disulfide-sulfur emulsion was made by emulsifying soap and water with carbon disulfide containing dissolved sulfur, and promising results were obtained from its use in the control of pear psylla and as a dormant spray for San Jose scale. (2) Sulfur-naphthalene dust was prepared by dissolving flowers of sulfur in melted naphthalene, then rapidly chilling the solution, and grinding the solid thus formed into a dust by means of a ball mill. As a greenhouse insecticide, this dust has proved effective against red spider (*Tetranychus* sp.) and aphids. (3) A colloidal sulfur was prepared by passing sulfur fumes into a dispersion medium, such as soap and water or glue and water. This method of manufacture has an advantage in that it obviates the necessity of changing the sulfur to some other form and recovering it again by chemical means. Field tests indicate that this preparation compares favorably with other colloidal sulfurs in the control of insects and apple scab.

Miscible oils and oil emulsions, J. G. SANDERS (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 287–292*).—The author points out that, while paraffin oil has been specifically recommended, asphalt base oils lend themselves more readily to emulsification. The variability of water content and base of fish oil soaps is discussed along with the variations in saponification value.

A new formula for making lubricating oil emulsions, W. D. WHITCOMB (*Jour. Econ. Ent., 18 (1925), No. 1, pp. 234, 235*).—In experiments conducted with the object of improving the stability and keeping qualities of lubricating oil emulsion, amyl alcohol or fusel oil gave promising results when used in the following formula: Potash fish oil soap (about 65 per cent water) 1 lb., fusel oil (amyl alcohol—technical) 4 liquid oz., lubricating oil (sp. gr. 0.88 to 0.90) 1 gal., and water 0.5 gal.

Fish oil, an efficient adhesive in arsenate of lead sprays, and results with other substances used, C. E. HOOD (*Jour. Econ. Ent., 18 (1925), No. 2,

pp. 280, 281).—In tests of the adhesive and spreading qualities of a number of substances, the drying oils proved to be the most satisfactory. While linseed oil was slightly better than fish oil, the latter was selected because it is much cheaper.

Factors affecting efficiency in fumigation with hydrocyanic acid, H. KNIGHT (*Hilgardia [California Sta.], 1 (1925), No. 3, pp. 35–56, figs. 10*).—By means of aspiration tests conducted in a gas-tight fumigatorium, with coccinellid beetles and red scale used as checks, the author found that it requires a mean concentration of about 0.45 per cent HCN for 20 minutes to kill every insect.

"In a gas-tight container the time and concentration factors may be varied reciprocally within certain limits. That is, if the concentration be reduced the exposure must be increased in the same ratio, or time $\times$ concentration $= K$. For an exposure of 40 minutes the mean concentration necessary to kill resistant red scale is approximately 0.20 per cent HCN and for black and *citricola* scale approximately 0.15 per cent HCN. In commercial fumigation the concentration is generally below these amounts. Leakage is influenced by both concentration and temperature. The highest concentration for a given dosage is maintained at the lowest temperature. The most efficient method of fumigation is by means of atomized liquid hydrocyanic acid. Insects become resistant to hydrocyanic acid when they become dormant or inactive, whether this condition is brought about by pupation, molting, or by low temperature. Susceptibility to the effects of temperature varies directly with the activity of the insect. Beetles are more susceptible than scale, and black scale more than red. Red scale does not become resistant to hydrocyanic acid at any temperature at which fumigation can be carried on with safety to the tree. A series of tests both under form tents and in the field, to determine the relative efficiency of the single-discharge and the interval-discharge methods of fumigation, showed that there is no practical advantage in the interval method so far as scale kill is concerned."

A newly recommended fumigant, ethyl acetate in combination with carbon tetrachloride, E. A. BACK and R. T. COTTON (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 302–308*).—This relates to investigations a report of which has been previously noted (E. S. R., 52, p. 661). The results obtained from use in small containers and from use in corn cribs are reported, the details being presented in tabular form.

The fumigation of "balled" nursery stock, B. R. LEACH and W. E. FLEMING (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 362–367, fig. 1*).—In continuation of work previously noted (E. S. R., 51, p. 763), the authors report the results of experimental work at the Japanese Beetle Laboratory, at Riverton, N. J., during which a closed container has been designed for nursery stock fumigation. Carbon disulfide is said to be the most satisfactory fumigant.

Some results of the defoliation of trees, C. W. MINOTT and L. T. GUILD (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 345–348, pl. 1*).—It is pointed out that, aside from the killing of trees by defoliation, there is a loss in growth of those that survive. Observations extending over 10 years are summarized.

Two dangerous defoliators of jack pine, S. A. GRAHAM (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 337–345*).—The author reports upon studies of the jack pine sawfly (*Neodiprion* n. sp.) and the spruce budworm.

Chinch bug barriers for Kansas conditions, J. W. MCCOLLOCH (*Kansas Sta. Circ. 113 (1925), pp. 6, figs. 3*).—A practical account is given of the creosote, tar, and dust barriers as used in combating the chinch bug.

Controlling bedbugs in steam-heated rooms, R. W. HARNED and H. W. ALLEN (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 320–331, figs. 2*).—This is a report of experiments conducted by the Mississippi Experiment Station, in

which the steam-heating system was used in summer. At temperatures of 120° F. and above, absolute control was secured by treatment of several hours' duration. A very high percentage of mortality was secured by exposures to temperatures averaging 110° when maintained for two days or more.

Preliminary note on the control of grape leaf hopper with calcium cyanide dust, J. R. EYER (*Jour. Econ. Ent., 18 (1925), No. 1, p. 235*).—The author reports that an exceedingly high percentage of adults and nymphs were killed by the use of both the calcium cyanide A and B dusts when the former was applied at the rate of 25 lbs. and the latter at the rate of 40 lbs. per acre.

San Jose scale control with lubricating oil emulsion on peach trees in the South, C. H. ALDEN (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 253–257*).—In investigations by the U. S. D. A. Bureau of Entomology in Georgia, the author found a 2 per cent lubricating oil emulsion, made from either the boiled or cold formulas, to give excellent scale control and to cause no tree injury even when used twice in one dormant season. Lime sulfur is said to have given poor control and to have caused some twig injury. Summer treatments with oil emulsion caused premature defoliation and were less effective than winter treatments.

The causes of outbreaks of the Angoumois grain moth, P. SIMMONS and G. W. ELLINGTON (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 309–320, figs. 2*).—The authors report that a study of the environment of the Angoumois grain moth in a selected area in the vicinity of Philadelphia during the past 28 years indicates that the principal factor influencing the occurrence of moth outbreaks there is the temperature from June to October. The time of harvest and winter temperatures also appear to be of importance.

Army worm egg parasite, W. P. FLINT (*Jour. Econ. Ent., 18 (1925), No. 1, p. 234*).—Studies of *Telenomus* sp., identified in 1916 (E. S. R., 36, p. 60), were carried on during an outbreak of the army worm in Illinois in 1924. It was found to be present in all fields where examinations were made, and in some cases the eggs were parasitized to the extent of from 40 to 60 per cent.

The oriental fruit worm, B. A. PORTER (*Indiana Sta. Circ. 122 (1925), pp. 8, figs. 5*).—A brief practical account of *Laspeyresia molesta* Busck.

Notes on the embargo of grapes from Almeria, Spain, on account of the Mediterranean fruit-fly (Ceratitis capitata Wied.), M. D. LEONARD (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 257–265*).—The author reports upon an investigation of conditions in the grape-growing sections of the Province of Almeria, including the topography, methods of grape culture, host plants of the fruit fly, and the amount of infestation. The organization of a clean-up campaign and the results obtained are outlined.

Intestinal myasis and the common house-fly (Musca domestica Linn.), T. H. FRISON (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 334, 335*).—The author reports upon a case of intestinal myasis caused by the larvae of the house fly at Champaign, Ill.

The alfalfa weevil in Nevada and its control by spraying, S. J. SNOW (*Nevada Sta. Bul. 108 (1925), pp. 22, figs. 4*).—The alfalfa weevil was first found in Nevada in 1920 at Tippett, White Pine County, and at Reno, since which time it has increased to destructive numbers in the vicinity where first found, between Reno and Sparks and a short distance down the Truckee River, and has spread to other important alfalfa sections. In the present account the author deals briefly with the life history of and injury by the weevil, and [illegible] with means for its control, including the results obtained from spraying with other [illegible]

ing with calcium arsenate in 1924, which show it to be an effective, practical, and profitable method of control.

Poison spray for grape root-worm (*New York State Sta. Bul. 519, pop. ed. (1925), pp. 3, pls. 2, fig. 1*).—A popular edition of the bulletin previously noted (E. S. R., 52, p. 558).

Observations on the life-history of Popillia japonica Newm., C. A. Thomas (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 357–361*).—The author compares the life history of this beetle during the years 1922–1924. The life history was similar in 1922 and 1923, but in 1924 the spring and summer phases were delayed about 10 days, due probably to unusual weather conditions during that period. Various habits of the adult and larvae are also discussed.

Emulsions of wormseed oil and of carbon disulfide for destroying larvae of the Japanese beetle in the roots of perennial plants, B. R. Leach and J. P. Johnson (*U. S. Dept. Agr. Bul. 1332 (1925), pp. 18, figs. 2*).—This is a report of investigations of materials of value in destroying the larvae of the Japanese beetle occurring in the matted root systems of Japanese iris, perennial phlox, sedum, etc., and in cavities of the old flower stems of peonies, etc. The investigations indicate that American wormseed oil (oil of chenopodium) and carbon disulfide give the most satisfactory results. When added to a hydrophile colloid and water both oil of wormseed and carbon disulfide are capable of forming stable emulsions, the toxic principle of which is retained indefinitely. When the larvae of the beetle, with no soil present, are immersed for six hours in a wormseed-oil dip the concentration of which is equal to 0.5 cc. of ascaridole, the active principle, to 3 liters of water, they are killed provided the temperature of the dip is maintained at from 65 to 70° F. When soil is present on the roots it absorbs some of the toxic material, slowing up its action on the larvae, and longer periods are required. As a result of the experimental work, it is recommended that Japanese iris and sedum be immersed for 15 hours and perennial phlox for from 9 to 18 hours, the time depending on the amount of soil present in the roots. In the case of peony roots it has been found advisable from the standpoint of cost to use a carbon disulfide emulsion dip, the plants to be immersed for 15 hours and the concentration to be equal to 0.5 cc. of emulsified carbon disulfide to 1 liter of water, at a temperature of from 65 to 70°.

A report on certain parasites of Popillia japonica Newm., J. L. King and H. C. Hallock (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 351–356, figs. 2*).—This is a summary of parasite introduction work conducted at the Japanese Beetle Laboratory, at Riverton, N. J.

The Mexican bean beetle, L. M. Peairs (*West Virginia Sta. Circ. 39 (1925), pp. 7, figs. 4*).—A brief practical account of this beetle, which at the close of 1924 occurred throughout the western part of West Virginia.

The flight activities of the honeybee, A. E. Lundie (*U. S. Dept. Agr. Bul. 1328 (1925), pp. 38, figs. 13*).—The author first describes investigations which have led to the perfection of a mechanical means by which the exits and returns of bees over long periods of time are automatically registered. The device finally adopted is described as a miniature balance on jeweled pivots. As the bee enters the tunnel fixed to one end of a lever, its weight, having a greater moment than the counterbalance, causes the tunnel to drop, and this movement produces three consecutive results: (1) It closes the door to prevent a second bee from gaining entrance to the case while the tunnel is on its downward stroke; (2) it establishes an electric contact by thrusting two platinum prongs, attached to but insulated from the lever, into two mercury cups; and (3) it opens a second door on a lower level, permitting the bee

to fly to the field or to enter the hive, as the case may be. The bee having left the tunnel, the counterbalance now has a greater moment than the empty tunnel, the second door is closed, contact is broken, and the first door is opened, so that the mechanism is now ready to count the next bee. This seesaw motion continues as long as bees are passing through the tunnel. A telephone message register, which consists of a simple cyclometer actuated by an electromagnet, was used as the counting device. While so far as can be ascertained the mechanical principles upon which the design was made are in general correct, it is pointed out that much work on further details is desirable.

The recording of individual flights by clamping the instrument to a hive was commenced on April 8, 1922, with 14 units of the apparatus in place, and from May 10, when 30 instruments were installed, to July 29, the readings being continued daily from daylight to dark, except for six days' interruption for adjustments. During this period some five million flights to and from the hive were recorded, the gross weight of the bees representing half a ton.

These studies are reported upon at length, much of the data being presented in tabular and graph form. They are discussed under the following headings: Factors introducing errors in the count, factors influencing the flight, the average duration of trips, the number of trips and the time spent within the hive, the death rate of the colony, and the behavior of the bees to the instruments. The results indicate that on an average a bee makes about 32 trips before death overtakes it.

Suggestions on queen rearing, H. B. Parks and A. H. Alex (*Texas Sta. Circ. 35 (1925), pp. 19, figs. 11*).—A practical summary of information on queen rearing.

A preliminary report on the use of calcium cyanide for the mound building ant, Formica exsectoides, J. A. Manter (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 348–351*).—It is stated that calcium cyanide in the granular form has been used to destroy *F. exsectoides* with promising results.

FOODS—HUMAN NUTRITION

Food and the principles of dietetics, R. Hutchison (*London: Edward Arnold & Co., Ltd., 1923, 5. ed., pp. XX+610, pls. 3, figs. 33*).—In the present revision of this handbook, an earlier edition of which has been noted (E. S. R., 25, p. 665), more prominence has been given to the differences in biological values of the various proteins, the importance of the vitamins in nutrition, and the dietetic treatment of diabetes.

Dietetics for nurses, F. T. Proudfit (*New York: Macmillan Co., 1923, 2. ed., rev., pp. XIII+524, figs. 2*).—The general principles of dietetics are discussed in the first three sections, dealing, respectively, with food and its significance, laboratory or diet kitchen work, and the human machine. The final section on dietotherapy considers the diet during pregnancy and lactation, the diet of infants and children in normal and abnormal conditions, and the diet of adults in the more common diseases, before and after operations, and in gout, obesity, and emaciation. Useful recipes and menus are given throughout the volume, and tables of food composition, sources of vitamins, height and weight, and the Pelidisi nutrition scale are included in the appendix.

Honey: Its use in the home, R. Jordan (*Indiana Sta. Circ. 121 (1925), pp. 12, figs. 3*).—This circular consists chiefly of recipes in which honey is used in place of sugar.

The iron content of spinach, A. Lichtin (*Amer. Jour. Pharm., 96 (1924), No. 5, pp. 361–364*).—Colorimetric determinations of the iron content of 13 samples of spinach, including two dehydrated and one commercially canned,

are reported, with minimum, maximum, and average values for the fresh spinach of 0.00267, 0.00867, and 0.00512 per cent. The average content of iron in the dehydrated spinach was 0.056832 and in the canned 0.00076 per cent.

The composition of canned pumpkin, A. E. STEVENSON (*Canning Trade, 48 (1925), No. 27, pp. 103–105; also in Canner, 60 (1925), No. 11, II, pp. 131, 132*).—Data are given on the composition of 17 samples of canned pumpkin, the data including total, soluble, and insoluble solids, invert sugar, sucrose, starch, dextrin, total and soluble protein, crude fiber, total ash, ash of soluble solids, and acidity.

Cereal gruel feeding, O. E. CHASE (*Jour. Amer. Med. Assoc., 84 (1925), No. 16, pp. 1173–1175*).—After reviewing briefly the literature on cereal feeding for infants, the author discusses his experience in the use of cereal gruels in 50 difficult feeding cases.

The stock formula for babies under 6 months of age was whole milk to the extent of 100 cc. per kilogram of body weight, an equal volume of water, and 16 gm. of farina. The mixture was cooked for 15 or 30 minutes in a single boiler, after which from 20 to 32 gm. of sucrose or from 48 to 80 gm. of dextrimaltose was added and the mixture made up to the original volume. The whole amount was divided into five bottles for the day's feedings at 4-hour intervals. As the weight of the babies increased, more milk was given in place of some of the water and the farina was increased to 48 gm. When constipation was present oatmeal was used occasionally in place of farina. In all cases orange juice or raw tomato juice and phosphorized cod liver oil were given as a routine measure.

A table is presented showing the average gains in weight over considerable periods in 24 representative cases. The average gain per child was 630 gm. for the 2 months preceding the cereal gruel feeding, and 1,413 gm. for the 2 months immediately following. There was improvement in the character of the stools in all but one case and in the general appearance in all cases.

The influence of food intake on the enzymatic concentration of human intestinal contents obtained from a duodenal fistula, D. N. SILVERMAN and W. DENIS (*Arch. Int. Med., 35 (1925), No. 3, pp. 357–361*).—In a subject with duodenal fistula through which specimens of the duodenal contents could be obtained without the interference with gastric function resulting from the use of a stomach tube, the ingestion in two portions at half hour intervals of 400 cc. of milk representing a mixture of protein, fat, and carbohydrate resulted in a stimulation of proteolytic and lipolytic activity one-half hour after the subject took the second portion of milk.

The ingestion of fat as cream in the same amounts as the milk caused a distinct stimulation of amylase and protease within 26 minutes after the first portion and 20 minutes later a marked increase in lipase.

The ingestion of protein with a small amount of fat in the form of eight egg whites and one yolk boiled 2 minutes caused a marked increase in the concentration of all three enzymes. In 1 hour 17 minutes the concentration of amylase and protease was about doubled and that of lipase had risen from 0 to 1.5 cc.

Starch, taken in the form of arrowroot biscuits, caused no stimulation of the production of amylase and but little that of protease.

The effects of external temperature on the basal metabolism of young women under usual conditions of dress, H. A. STILLMAN and M. LAWRENCE (*Missouri Sta. Bul. 228 (1925), p. 65*).—Basal metabolism determinations were conducted for a period of 90 days on 12 college women under varying conditions of temperature and dress. As compared with the determinations made under the usual conditions, 8 showed an increase and 4 no change in

metabolic rate when the determinations were made with dress and temperature as in outdoor conditions of from 5 to 15° C. (41 to 59° F.). Under sleeping conditions, 10 showed an increase and 2 no consistent change in the metabolic rate. "These tests indicated an increase in the metabolism rate and, therefore, an increase in the energy requirement due (1) to the kind of clothing worn in winter and (2) breathing cold air."

Basal metabolism in undernutrition [trans. title], M. LABBÉ and H. STÉVENIN (*Presse Méd.* [*Paris*], *33* (*1925*), *No. 25, p. 401*).—Data are reported on the basal metabolism of 10 subjects suffering from malnutrition either self-imposed or the result of digestive disturbances. As compared with normal figures for age, height, and weight, all but 2 of the subjects showed a lowered metabolism varying from 10 to 39 per cent below normal. In 1 the metabolism was 12 per cent above and in 1 practically normal.

The general lowering of the basal metabolism is considered of importance in the diagnosis of conditions involving loss in weight, such as tuberculosis, exophthalmic goiter, and simple malnutrition. In the first two the basal metabolism is increased.

The effect of ingestion of yeast on the leukocyte count, E. L. HEINTZ and W. H. WELKER (*Arch. Int. Med.*, *35* (*1925*), *No. 4, pp. 500–502, figs. 2*).—A comparison is reported of the leucocyte count for 8 successive days of 6 subjects on ordinary diet and 12 on ordinary diet plus 3 cakes daily of yeast. In most cases the leucocyte count of the subjects taking yeast showed a marked increase over the previous period without yeast.

The antiscorbutic value of commercially concentrated orange juice, H. GOSS (*Hilgardia* [*California Sta.*], *1* (*1925*), *No. 2, pp. 15–34, figs. 14*).—With fresh orange juice as a standard, the relative antiscorbutic properties of various commercial concentrates of orange juice were tested by prophylactic experiments with guinea pigs on a basal diet of oats, barley, wheat, hay, and water. The products tested included concentrated whole juice, prepared from ripe navel oranges by processing for about 4 hours under high vacuum at a temperature between 40 and 45° C. (104 to 113° F.); clarified orange sirup, prepared from whole fruit by heating for 30 minutes at 185° F., filtering through Filter-Cel (a process requiring about 4.5 hours), allowing to stand overnight, adding a small amount of sugar, and concentrating in glass enamel vacuum pans for about 7 hours under a vacuum of 28 in. of mercury; desiccated orange juice, prepared by a spray drying process, with the addition of a little cane sugar; and dried, ground, whole orange, a product prepared from sound cull oranges by grinding the fruit, allowing it to stand overnight, and then drying in a dehydrator for about 8 hours at a temperature of from 155 to 175° and low humidity. A concentrated lemon juice, prepared similarly to the orange concentrate except that the juice was held for 24 hours preserved with 6 oz. of potassium metabisulfite to 100 gal., was also used.

The minimum protective dose of fresh orange juice was found to be 1.5 cc., of the concentrated whole juice between 0.25 and 0.5 gm. equivalent to between 1.1 and 2.2 cc. of fresh juice, of the clarified sirup 0.37 to 0.5 gm. representing from 1.3 to 1.8 cc. of the juice, and of the whole dried orange 0.4 gm. representing 2 gm. of fresh orange. While the data of the other two products are not sufficient enough to be conclusive, the minimum dose of the desiccated orange juice appeared to lie between 0.5 and 1 gm., representing from 1.5 to 3 cc. of fresh juice. On the lemon juice 2 guinea pigs were maintained for 2 months on a 0.5 gm. dosage equivalent to 2.2 cc. of the fresh juice.

It is concluded that all of the commercial products tested are good sources of vitamin C.

Has winter-ripened fruit antiscorbutic value? (*Wisconsin Sta. Bul. 373 (1925), pp. 68, 69*).—In a study made by H. Parsons guinea pigs which were affected with scurvy as a result of feeding a standard scorbutic ration were daily given various doses of the juice of tomatoes, picked green and ripened in the warehouses away from the light. The use of these green ripened tomatoes failed to save the lives of the guinea pigs affected with scurvy and, except in a few cases, did not even prolong their existence.

Fish liver a vitamin rich food (*Wisconsin Sta. Bul. 373 (1925), p. 68*).—In feeding canned livers from Lake Michigan fish to rats which had been maintained on a diet low in the antirachitic vitamin it was found that the livers were high in their power to heal rickets, the burbot and whitefish livers ranking somewhat higher than the trout liver. Chicken liver was also tried and found to have a high concentration of the antirachitic vitamin, while calf and beef liver was strikingly inferior in this respect.

The effect of chemical preservation of eggs upon the stability of their vitamin contents, E. Tso (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 263–265*).—It is reported briefly that Chinese preserved ducks' eggs, "pidan," are as rich in vitamin A and the antirachitic factor as fresh ducks' eggs, but are practically devoid of vitamin B. Three per cent of the preserved yolk or 2 per cent of the ether extract of the yolk furnished sufficient vitamin A in curative experiments with rats. Five per cent of the yolk cured xerophthalmia as promptly and brought about as vigorous growth as the same amount of fresh yolk. The same amount was also effective in preventing and healing rachitic bone changes in rats on the Sherman-Pappenheimer diet 84. The preserved yolk when fed to the extent of 25 per cent of the ration was without effect as a source of vitamin B.

Local and general defences against infections, and the effect on them of vitamin-deficiency, W. Cramer and A. N. Kingsbury (*Brit. Jour. Expt. Path., 5 (1924), No. 5, pp. 300–304*).—To determine the cause of the diminution in resistance against infections which results from a deficiency of vitamin A, an examination was made of the blood of 7 rats which had been kept on a diet deficient in this vitamin.

Three of these rats gave negative blood cultures and 4 positive (*Staphylococcus albus, S. aureus*, streptococcus, and pneumococcus). Of 5 normal controls 4 gave negative and 1 positive (*S. albus*) blood cultures.

The blood of all of the vitamin-deficient rats gave positive agglutination tests against *Bacillus coli*, although coliform bacilli were not present in the blood. A further proof that vitamin A deficiency does not inhibit the development of agglutinins was furnished by the positive results obtained in agglutination tests against *B. typhosus* after the animals had been injected with killed cultures of this organism.

An examination of the blood of 5 of the vitamin-deficient rats for fragility of the red blood corpuscles showed no difference from the normal. Inoculation with different bacteria demonstrated no apparent diminution in the general resistance of the vitamin-deficient rats except in infections with *B. tuberculosis* (bovine type), to which rats are normally immune. In 2 vitamin-deficient rats injected intraperitoneally with this organism, the mesenteric glands became enlarged and gave positive smears, while negative results were obtained with 2 normal controls which had received the same injections.

It is concluded that a deficiency in vitamin A does not diminish the efficiency of the general humoral defenses of the body, but that it does that of the local tissue defenses. "Under the ordinary conditions of vitamin experiments, the

breaking down of local defenses allows access to the comparatively avirulent bacteria which normally inhabit the intestine, the respiratory tract, or the conjunctival sac, so that the resulting infections are as a rule avirulent in type. When organisms of a more virulent type are present, the condition of the local defenses rather than the mere presence of these organisms may be the factor which determines the onset of a virulent infection."

A contribution to the aetiology of experimental keratomalacia, G. M. Findlay (*Brit. Jour. Expt. Path., 6 (1925), No. 1, pp. 16–21, figs. 3*).—In an effort to explain the etiology of keratomalacia resulting from a diet deficient in vitamin A, young rats were given a basal diet on which at least 80 per cent of the animals developed keratomalacia in from 35 to 50 days and, together with normal controls, were subjected to various treatments as follows:

Material aspirated from the conjunctival sacs of 3 rats suffering from advanced keratomalacia was inoculated directly into the conjunctival sacs of 12 normally fed rats and 12 rats which had been for 25 days on the basal diet. No cases of keratomalacia developed among the normal rats, and in the other group keratomalacia developed no earlier and was no more severe than in a similar group of uninoculated animals on the deficient diet.

A comparison was made at intervals of the lytic titer for *Micrococcus lysodeikticus* of the tears and blood serum of 3 normally fed rabbits and 3 others on a ration deficient in vatmin A. There was no change in the lytic action of the serum but a definite decrease in that of the tears with the onset of keratomalacia.

A group of 20 young rats which had been kept for 25 days on the basal diet was divided into two equal groups, one of which received no treatment. The conjunctival sacs of the eyes of the rats in the other group were bathed twice daily with undiluted human tears. In the untreated group, 9 developed keratomalacia and 1 died of broncho-pneumonia without symptoms of eye trouble. In the other group, 9 died of broncho-pneumonia without evidence of eye trouble and 1 developed keratomalacia.

In an experiment similar to the above except that the tears were heated for 30 minutes at 70° C., 2 of the 10 treated animals and all the controls developed keratomalacia. With Locke's solution in place of tears 4 out of the 10 treated, and with physiological salt solution 8 out of the 10 treated, developed keratomalacia.

Six normal rats and 6 rats which had been on the basal diet for 24 hours were inoculated subcutaneously twice daily for 5 days with 0.01 gm. of pilocarpine hydrochloride. In the normal rats increased lacrimation followed the injection, but subsided promptly. In the others the lacrimation was similarly increased at first, but after 4 days the secretion was reduced in amount and changed in character. The conjunctiva became inflamed and the cornea opaque.

These results are thought to favor "the hypothesis that the absence of vitamin A in the diet causes a change in the secretion of the paraocular glands, as a result of which hyalinization of the conjunctiva occurs, accompanied by bacterial invasion of the tissues."

Calcium and phosphorus metabolism in osteomalacia, L. M. Miles and C. T. Feng (*Jour. Expt. Med., 41 (1925), No. 1, pp. 137–157*).—Interesting observations on the relation of diet to osteomalacia are reported from the Peking Union Medical College, Peking, China.

Preliminary observations were made of the calcium content of the blood serum, the phosphorus content of the blood plasma, and the CO_2-combining

power of the plasma of 10 patients with osteomalacia who had been kept for a week on a uniform diet similar to the restricted home diet of the patients. The minimum and maximum figures for calcium were 5 and 7.4 mg. per 100 cc. and for phosphorus 1.8 and 3.8 mg. per 100 cc., respectively. The variations from normal in both cases appeared to depend upon the severity and duration of the disease. The CO_2-combining power of the plasma varied from 47.5 to 57, the values in no case indicating an acidosis.

At the end of the preliminary period all but one of the patients were continued upon the same diet with the following additions: Two received 30 cc. of cod liver oil and 2 gm. of calcium lactate daily, two 3 gm. of calcium phosphate, one 2 gm. of calcium lactate, two a liberal diet, including milk, eggs, and plenty of fresh vegetables, and two 30 cc. of cod liver oil daily. After 12 days the blood was again analyzed for calcium and phosphorus. The variations in phosphorus showed no correlation with the treatment, but the patients receiving cod liver oil either alone or with calcium salts showed a gain in blood calcium. Of the three receiving calcium salts with no oil, two showed an increase and one no change in calcium. The two on a liberal diet showed a decrease in calcium and were clinically worse, as was the one receiving only calcium phosphate. Those receiving cod liver oil felt greatly benefited by the treatment.

To complete the study, a metabolism experiment was conducted on four patients who were kept on diets of known composition adequate as to calories and phosphorus but somewhat deficient in calcium. As determined by the analyses of the 7-day samples of the urine and feces, the calcium balance was negative in three of the four subjects and the phosphorus balance positive in all. The calcium and phosphorus in the blood were below normal in all cases. The patients were continued for 12 days longer on the same diet, with various treatments and metabolism experiments conducted during the final seven days. The treatment and resulting changes in the calcium and phosphorus balances for the four subjects were as follows: In one patient receiving cod liver oil in doses of 8 cc. three times a day, the calcium balance changed from negative to positive and the blood calcium rose from 7.503 to 8.62 mg. per 100 cc. Another received the same amount of cod liver oil and in addition 1 gm. daily of calcium lactate. The calcium balance in this case changed from slightly negative to markedly positive, and the blood calcium rose from 6.395 to 8.197 and the phosphorus from 1.24 to 2.1 mg. Even more marked changes in the same direction took place in the third subject who received cod liver oil and calcium phosphate in place of lactate. The fourth patient received three 8-cc. doses of olive oil and 1 gm. of calcium lactate daily. The calcium balances remained negative and the blood calcium increased. Clinical improvement was noted in all but the last subject.

It is concluded that osteomalacia is a dietary deficiency disease resembling rickets in being due chiefly to a deficiency in the fat-soluble vitamin content of the diet, associated in some cases with calcium deficiency.

A list of 26 titles to the literature is appended.

On the glycogenic function of the liver and its endocrine control, W. Cramer (*Brit. Jour. Expt. Path., 5 (1924), No. 3, pp. 128–140, pls. 2, figs. 3*).—This theoretical discussion of the relation of the liver to carbohydrate metabolism is based upon the relation to the different endocrine organs (the thyroid, adrenals, and pancreas) to carbohydrate and nitrogen metabolism. This relation is summarized in the following table in which + stands for an increase above and — a decrease below normal.

The relation of the endocrine glands to metabolism

	Liver glycogen	Blood sugar	Consumption of carbohydrates	Glycosuria	N. excretion	Temperature
Hyperthyroidism	− −	+	+	−	+ +	+
Hyperadrenalinism (sympathetic fever)	− −	+	+	−	+ +	+ + +
Hyperinsulinism	−	− −	+	−	−	− −
Hypoinsulinism (diabetes mellitus)	− −	+ + +	− − −	+ + +	+ +	Normal

The explanation of the disappearance of the glycogen from the liver in these different conditions is essentially as follows: The glycogen of the liver is considered to be not a reserve store of excess carbohydrate but a product of secretion in the liver cells independently of any supply of preformed carbohydrate in the food. The glycogen thus formed is secreted into the blood as glucose to keep the blood sugar above a fixed minimal level. The specific protein-sparing action of carbohydrates in the general metabolism is explained as a protection of the protein from being used by the liver for the formation of glycogen. The pancreatic hormone is thought to inhibit the glycogenic function when the hormone is absent, as in diabetes the glycogenic function of the liver becomes hyperactive, resulting in an increased formation of carbohydrate in the liver and secretion into the blood. The glycogenic function is stimulated by the thyroid and adrenals. This stimulation leads in the normal organism to increased oxidation of carbohydrates, increased formation of carbohydrates from proteins, increased heat production, and increased nitrogen excretion.

Insulin, F. G. Banting (In *Proceedings of the International Conference on Health Problems in Tropical America, 1924. Boston: United Fruit Co., 1924, pp. 728–743*).—This paper consists of a brief outline of the principles underlying the action and use of insulin in diabetes. The discussion following the paper includes a contribution from S. Harris on hyperinsulinism and dysinsulinism, which is essentially as previously noted (E. S. R., 53, p. 368).

The antagonistic action of certain sugars, amino acids, and alcohols on insulin intoxication, C. Voegtlin, E. R. Dunn, and J. W. Thompson (*Amer. Jour. Physiol., 71 (1925), No. 3, pp. 574–582*).—In this investigation the effect upon insulin intoxication of various substances capable of being converted into glucose in the animal body was tested by injecting several series of 10 rats each with a previously-established m. l. d. of insulin and administering by stomach tube immediately thereafter graded doses of the substance to be tested. The method is considered to have an accuracy of from 20 to 50 per cent.

Of the carbohydrates tested, galactose was slightly less efficient than glucose; maltose, lactose, sucrose, and trehalose equally efficient; and fructose more efficient. Xylose and *l*-arabinose were of doubtful value and inulin inactive.

Of the two alcohols tested, glycerol was very effective and mannitol only slightly effective. Lactic acid, pyruvic acid, glycine, and glutaminic acid were inactive and *d*-alanine as effective as glucose. Olive oil was moderately active, probably through its glycerol component.

Thrice-cooked vegetables for diabetics, H. A. Stillman (*Missouri Sta. Bul. 228 (1925), pp. 62, 63*).—In tests with 16 rats from 40 to 55 days old, receiving unlimited quantities of a basal diet consisting of 15 per cent purified casein, 10 per cent Crisco, 72 per cent cornstarch, and 3 per cent salt mixture,

satisfactory growth was obtained with 4 gm. of raw spinach, but no growth with 4 gm. of thrice-cooked spinach, and 5 of the 8 rats receiving it died within 48 days. It is concluded that thrice-cooked vegetables contain a relatively insignificant amount of vitamin.

Goiter in the intermountain region of Utah, G. W. Middleton (*Jour. Amer. Med. Assoc., 84 (1925), No. 16, pp. 1172, 1173*).—In connection with a brief discussion of the author's experience in the surgical treatment of goiter, attention is called to the increase in goiter incidence in certain sections of Utah subsequent to the installation of water systems having their source of supply in the mountain springs. Previous to this, wells and surface springs supplied drinking water to these communities, and there was comparative freedom from goiter.

The increase in goiter is attributed to the lack of iodine in the springs coming from the igneous rocks. "Since iodine is a volatile substance, we would naturally expect that the igneous rocks and the springs of water that come from them would be absolutely iodine free. Theoretically, all volcanic or granitic sections of country should have a relatively large percentage of goiter incidence. Whether this is the case or not remains to be proved, but in the data available in this intermountain region there is at least a marked indication in that direction."

Sodium iodide treatment of Rochester's water supply, B. C. Little (*Jour. Amer. Waterworks Assoc., 12 (1924), No. 1, pp. 68–86, fig. 1*).—Arguments for and against the sodium iodide treatment of water for goiter prophylaxis as practiced in Rochester, N. Y., are presented in this paper and accompanying discussion.

ANIMAL PRODUCTION

[The relation of sunlight to nutrition] (*Wisconsin Sta. Bul. 373 (1925), pp. 80–85, figs. 4*).—The effects of sunlight on the production and growth of animals have been investigated.

Sunlight as a factor in poultry production.—E. B. Hart, H. Steenbock, J. G. Halpin, and O. N. Johnson found that chicks could be successfully raised on a ration of yellow corn and skim milk, with 1 per cent of sodium chloride and 2 per cent of ground limestone, provided exposure to sunlight was allowed, but chicks died or made only limited growth on the same ration without sunlight.

A small amount of light keeps chicks normal.—In further experiments the birds grew well on a ration of casein, dextrin, yeast, agar, and salt, plus 1.5 per cent of clover dried in the attic when 5 minutes' daily exposure to ultraviolet light was allowed. One minute's exposure at 3-day intervals was, however, insufficient to promote normal growth.

Light may give antirachitic properties to food.—The exposure of rations deficient in the antirachitic factor to sunlight or ultraviolet light was found by Steenbock to promote normal growth in rats. By the exposure of olive oil and lard to a quartz mercury vapor light for 30 minutes, these substances were found to contain the antirachitic factor. The saponified fat of the irradiated olive oil likewise contained the vitamin. Rats which developed rickets on a ration consisting largely of corn and wheat grew normally when the ration was exposed to ultraviolet light.

Sunlight important in pork production.—Two lots of 6 pigs each were raised by Steenbock and Hart on a ration of yellow corn, salt, and lime, with 4 lbs. of skim milk daily per pig, while two other lots received the same ration except for the substitution of white corn in place of the yellow corn. One lot of each

group was allowed an outdoor run for exposure to sunlight, while the other lot received no direct sunlight. Stiffness developed in both lots not receiving sunlight, while the other two lots were normal. Blood analyses from the latter lots showed the presence of more inorganic phosphorus, and the bones were higher in ash.

Sunlight affects milking animals.—In studies by C. A. Elvehjem, Steenbock, and Hart, milking goats were brought into a distinct negative calcium balance on rations of grains and wheat straw without exposure to sunlight. By exposing these animals to ultraviolet light for from 10 to 20 minutes daily, the inorganic phosphorus of the blood was raised from 5 to 8 mg. per 100 cc., and positive calcium balances were established.

The relation of diet to bodily activity and the capacity to withstand unfavorable circumstances, A. G. Hogan and H. M. Harshaw (*Missouri Sta. Bul. 228 (1925), pp. 36, 37*).—In experiments on rearing rats on synthetic diets, most of which were modifications of casein 20 per cent, starch 53, milk fat 10, cod liver oil 5, dried yeast 6, salt mixture 4, and agar 2 per cent, considerable difficulty has been encountered in the reproduction and rearing of young to weaning age. Additions of agar, Vitavose (a commercial preparation of vitamin X), and alcoholic extracts of wheat germ have been made in the ration without producing any improvement. A fifth generation has now been reared on the synthetic ration, which should be deficient in vitamin X, except for a small quantity possibly present in the milk fat.

The relation of feed consumed to protein and energy retention, A. G. Hogan, L. A. Weaver, A. T. Edinger, and E. A. Trowbridge (*Missouri Sta. Research Bul. 73 (1925), pp. 3–42, figs. 29*).—In studying the relative energy and total energy retention by swine, 8 bacon (large Yorkshire) and 8 lard (big type Poland-China) hogs averaging approximately 100 lbs. in weight were selected and fed on a ration of corn and shorts 45:45, with 10 per cent of tankage. One pig of each type was killed for analysis at 100 lbs. and at 50-lb. intervals up to 300 lbs. The records included individual feed consumption, live and dressed weights, measurements, photographs, chemical analyses of the right side of the carcass, physical analyses of the left side, surface area of one-half of the animal as determined by the skin, and determinations of the warm and cooled weights of the organs and viscera. The chemical analyses consisted of determinations of water, nitrogen, protein, fat, and ash for the inedible offal and blood, bone, and lean, fat, and edible internal organs. The physical analyses included the weights of the wholesale cuts before and after curing, as well as determinations of the lean, fat, and bone. The data are tabulated in detail.

In discussing the results, the authors point out that there was little difference in the rate of gain, kinds and amounts of nutrients stored, and in the chemical analyses of the two types of pigs of similar live weights, but differences in the relative proportions of the different cuts of the carcasses were apparent. Feed was utilized more efficiently by the younger pigs. The gains in protein were constantly more expensive, while gains in fat were less expensive as the live weight increased. A little over 40 per cent of the net energy consumed by the animals was stored in their tissues.

The surface area of swine was found to be relatively accurately determined by the formula

$$S=L^{.6}\times W^{.4}\times K,$$

in which S is the surface area in square centimeters, L is the length of body in centimeters, W is the weight in kilograms, and K is the constant 175.

Legume forages with corn and cane for silage, H. E. Dvorachek, F. H. Herzer, R. H. Mason, H. E. Reed, and E. Martin (*Arkansas Sta. Bul. 196 (1925), pp. 3–14*).—The results are reported of experiments conducted from 1917 to 1924 in determining the comparative advantage of mixing soy beans and cowpeas with corn and cane silage for the feeding of beef and dairy cattle, parts of which have been previously noted (E. S. R., 47, p. 772).

From the results of all experiments, the authors conclude that the mixing of legumes with corn or cane produces a silage which keeps well and is more palatable than silage made from corn or cane alone. Such mixtures were also more valuable pound for pound for milk and fat production and for beef production than cane silage or corn silage alone. Silage made from immature cane and soy beans had poor keeping qualities and was inferior in feeding value to silage made from mature corn, though it was consumed fairly well by the cattle.

Is there danger to livestock from moldy silage? (*Minnesota Sta. Rpt. 1924, pt. 2, pp. 17–19*).—In studies of the effect of moldy silage on cattle, 3 animals were fed moldy silage for 128 days without ill effects. In a further test 4 cows were fed moldy silage which had been suspected of causing the death of 5 cattle. No ill effects resulted after 2 weeks' feeding. This silage was later fed to a horse and some sheep with like results. Pure cultures of mold from silage were given the animals as drenches again with negative results, including examinations made of the cattle after slaughter.

Inspection of feeds, J. B. Smith and W. L. Adams (*Rhode Island Sta. Ann. Feed Circ., 1925, pp. 12*).—The guaranties and protein and fat analyses of the 117 samples of feeding stuffs officially collected during the season 1924–25 are reported (E. S. R., 51, p. 467).

Winter steer feeding, 1923–1924, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 291 (1925), pp. 22*).—The steer feeding experiment conducted during 1923–24 was practically a repetition of the one conducted during 1922–23 (E. S. R., 52, p. 168) except that the lighter cattle were fed for 7 months instead of 8 and the full feeding of corn to these two lots was begun at 60 days instead of 90 days. The following table gives a summary of the results:

Summary of Indiana 1923–24 winter steer feeding trials

Lot	Average initial weight	Average daily gain	Feed consumed per pound of gain						Selling price per 100 pounds	Pork produced [1]
			Shelled corn	Cottonseed meal	Soy bean oil meal	Whole soy beans	Corn silage	Clover hay		
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*		*Pounds*
1	970	2.58	4.70	----------	0.99	----------	11.75	1.08	$9.50	1,125
2	973	2.39	5.06	----------	----------	1.07	13.27	1.34	9.60	1,160
[2] 3	972	2.30	5.23	----------	----------	1.11	13.16	1.15	9.40	1,110
4	967	2.60	4.85	1.03	----------	----------	12.93	1.19	9.70	922
5	844	2.36	3.90	1.08	----------	----------	13.55	1.36	8.70	960
6	848	2.20	4.44	----------	----------	----------	14.82	1.65	8.30	905
7	974	2.39	5.46	----------	----------	----------	13.80	1.35	9.20	1,025

[1] Corn to the extent of 3,909 pounds was fed to the hogs in each lot except 5 and 6, which received 2,625 pounds of corn per lot.
[2] Salt given other lots replaced by a mineral mixture of acid phosphate, limestone, and salt equal parts.

The bulletin summarizes the results in three divisions dealing, first, with a comparison of cottonseed meal, soy bean oil meal, whole soy beans, and whole soy beans with a mineral mixture as supplements to a corn, silage, and clover hay ration for 2-year-old steers; second, the advantages of adding cottonseed meal to this basal ration are discussed; and third, the comparative returns to be expected from fattening heavier and lighter cattle are calculated. The financial returns from each lot have been estimated and are tabulated at the end of the bulletin.

[Experiments with beef cattle at the Missouri Station], E. A. Trowbridge et al. (*Missouri Sta. Bul. 228 (1925), pp. 32, 40, 41*).—The results of experiments with beef cattle are reported, mainly in continuation of those previously noted (E. S. R., 51, p. 771).

Factors influencing the normal rate of growth in domestic animals and the permanency of the effects of arrested development, A. G. Hogan.—The 7 steers under observation in this experiment are still growing slightly, as indicated by their measurements, though now 7 years of age.

Limited grain rations for fattening cattle of different ages, E. A. Trowbridge and H. D. Fox.—Two lots each of calves and yearlings were fed in this experiment. One lot of each age was full fed for 150 days on shelled corn and linseed meal (6:1), with corn silage and clover hay. Another lot at this age received corn silage and clover hay for 90 days in dry lot, followed by the addition of shelled corn and linseed oil meal, and the elimination of silage and hay during the next 18 days, followed in turn by 102 days' full feeding with corn and linseed oil meal on pasture. The average daily gains per head were as follows: Yearlings full fed in dry lot, 2.93 lbs.; yearlings fed for the longer period, 1.95 lbs.; calves full fed in dry lot, 2.5 lbs.; and calves fed during the longer period, 1.72 lbs. The calves required less grain but more roughage per unit of gain than the yearlings.

Alfalfa versus clover hay for fattening cattle (*Wisconsin Sta. Bul. 373 (1925), pp. 92, 93*).—The results of this trial showed less difference between the values of alfalfa and clover hay than in the preceding year (E. S. R., 51, p. 468). The rations compared consisted of 5.3 lbs. of clover or alfalfa hay, 27 lbs. of corn silage, 10 lbs. of corn, and 1.4 and 0.8 lbs., respectively, of cottonseed meal with the clover and alfalfa hay rations. The gains of the two lots were equal, indicating the superiority of alfalfa because of the smaller amounts of cottonseed meal required in this ration.

Fattening steers on velvet beans, S. W. Greene and A. T. Semple (*U. S. Dept. Agr. Bul. 1333 (1925), pp. 27, figs. 8*).—The results are reported of six experiments conducted for the purpose of studying the feeding value of velvet beans when fed with silage for fattening steers. Four of the experiments were carried on in Mississippi in cooperation with the Mississippi Station, one of the experiments having been previously noted (E. S. R., 49, p. 465). The other two tests were carried on at Beltsville, Md. Whole, dry, ground, and soaked velvet beans were compared in the different experiments, as well as cottonseed meal. The roughage consisted mostly of corn silage, though sorgo silage was fed in one experiment, and additional dry roughage was furnished in others. The results of the six experiments are briefly summarized in the following table:

Velvet beans for steers

Place of experiment	Year	Duration	Lot	Average initial weight	Average daily gain	Feed consumed per 100 pounds gain						
						Whole velvet beans	Ground velvet beans	Soaked velvet beans	Cottonseed meal	Corn	Corn silage	Dry roughage
		Days		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Collins, Miss.	1918	94	1	660	1.41	618					1,703	
Do	1918	94	2	660	1.37		625				1,729	
Beltsville, Md	1918	112	1	777	2.30				192		1,470	[1] 328
Do	1918	112	2	786	1.70	439					1,550	[1] 417
Do	1918	112	3	773	1.50		382				1,753	[1] 476
Do	1918	112	4	772	2.00			482			1,176	[1] 363
Do	1919	126	1	726	2.36				212		1,745	[2] 74
Do	1919	126	2	735	2.44				120	304	1,258	[2] 70
Do	1919	126	3	732	2.44			255		304	1,037	[2] 71
Do	1919	126	4	732	2.12			408	53		1,331	[2] 80
McNeill, Miss	1920	84	1	810	2.10				240		2,389	
Do	1920	84	2	786	2.80	425					1,425	
Do	1920	84	3	802	2.20			531			1,852	
Do	1921	96	1	839	1.50	513			56		2,005	[3] 342
Do	1921	98	2	840	1.70	620					1,732	[3] 307
Do	1921	98	3	841	1.80			564			1,575	[3] 280
Do	1922	98	1	773	2.10				279		[4] 2,449	
Do	1922	98	2	770	2.00	560			11		[4] 1,832	
Do	1922	98	3	773	1.80			656	12		[4] 2,065	

[1] Corn stover and wheat straw. [2] Wheat straw. [3] Cottonseed hulls. [4] Sorgo silage.

Hogs following the steers did not make satisfactory gains. The authors conclude from the experiments that dry, whole velvet beans produced satisfactory gains with silage and were more economical than when ground or soaked. The ground beans were less palatable than the whole beans and would not keep well. Two lbs. of velvet beans were found practically equal to 1 lb. of cottonseed meal, but the latter concentrate was more palatable and produced more rapid gains.

Feeding baby beef (*Minnesota Sta. Rpt. 1924, pt. 2, pp. 4–7, figs. 4*).—The results of two experiments dealing with the production of baby beef, using Shorthorn and Angus calves, are reported in addition to the results previously noted with Herefords (E. S. R., 48, p. 661). The results showed that the production of baby beef was a profitable enterprise, especially when animals of good breeding are used. The time for fattening 6- to 9-months-old calves averaging from 350 to 500 lbs. in weight should not be less than 200 days. The most satisfactory ration consisted of silage, alfalfa hay, ground ear corn, and 2 lbs. of oil meal per head daily. Shelled corn with or without oats may be used, but the oats should be reduced in amount toward the end of the feeding period. Self-feeding corn was found satisfactory. The necessity of supplying legumes or a high protein supplement and the desirability of silage are pointed out.

Sheep—care and management, A. E. Darlow (*Oklahoma Sta. Circ. 58 [1925], pp. 8, fig. 1*).—Popular directions for the care, management, and feeding of sheep.

The problem of producing more and better lambs in Nevada range flocks and feeding and finishing range ewes and lambs, C. E. Fleming (*Nevada Sta. Rpt. 1924, pp. 16–18, fig. 1*).—Tests of the comparative value of purebred and inferior rams obtained from range flocks have indicated that the purebred rams will materially increase the amount, uniformity, and quality of the wool and mutton produced. At the age of 180 days single and twin lambs, respectively, sired by purebred rams averaged 71.75 and 66.75 lbs.,

lambs sired by crossbred rams averaged 67.25 and 63.25 lbs., and those sired by grade rams averaged 61.75 and 54 lbs., respectively. The lambs sired by purebred rams not only made better gains in the feed lot and required less time for finishing, but they made more economical utilization of the feed consumed.

In studying the value of different rations for ewes prior to and during lambing, alfalfa alone and with supplements of corn and oats, sunflower silage and corn and oats, and corn silage and corn and oats were tried. The results showed that the lambs of all groups were quite uniform in weight.

A comparison of western lambs, native Ohio mutton lambs, and native Ohio fine wool lambs as feeders, D. S. Bell and G. Bohstedt (*Ohio Sta. [Leaflet], 1924, pp. [2]*).—Essentially noted (E. S. R., 52, p. 468).

[Hog feeding experiments at the Guam Station], C. W. Edwards (*Guam Sta. Rpt. 1923, pp. 2, 3, fig. 1*).—Brief results of the following experiments are noted:

Rice, fresh coconut, and meat scraps for weanlings.—Eighteen pigs fed for 62 to 86 days following weaning at 10 weeks of age made an average daily gain of 0.61 lb. per head on a ration consisting of 2 parts of cooked damaged rice, 1 part of fresh coconut, and 10 per cent meat scrap, with pasture. An average of 418 lbs. of feed were consumed per 100 lbs. of gain.

Breadfruit, copra meal, rice, cowpeas, and tankage for sows with litter.—A ration of 4 parts of cooked breadfruit, 2 parts of copra meal, 1 part of rice, and 1 part of cowpeas, with fresh Para grass and minerals, proved satisfactory for sows suckling pigs, as all sows kept in good condition and the growth of the litters indicated that an ample milk supply was being furnished.

Fresh cassava, copra meal, and tankage for sows with pig.—Sows receiving a ration of 2 parts of fresh cassava and 1 part of copra meal, supplemented by 2 oz. of tankage daily, and running on Para grass pasture, from 1 month before breeding until 10 days before farrowing were kept in good condition and farrowed strong, healthy litters.

Native variety of cassava for swine.—No ill effects followed feeding of the native or bitter variety of cassava to both young and old pigs during a 30-day period, notwithstanding the fact that toxic properties are frequently attributed to this plant.

[Experiments with swine at the Missouri Station] (*Missouri Sta. Bul. 228 (1925), pp. 31, 32, 38–40*).—The results of experiments with swine are briefly reported, many of which are continuations of experiments previously noted (E. S. R., 51, p. 772).

Age as a factor in animal breeding, F. B. Mumford and F. F. McKenzie.—In continuing this project, the fifteenth generation of early breeding has now been obtained, a gilt of the fourteenth generation having farrowed her first litter of 8 pigs at 10 months 26 days of age.

Age as a factor in animal breeding—the effect of plane of nutrition upon immature brood sows, F. B. Mumford and F. F. McKenzie.—The 2 fourth generation sows on the high plane of nutrition farrowed at 10 and 12 months of age, respectively. The fourth generation sow on the medium plane was bred at 8 months 13 days of age, but the fourth generation sow on the low plane had not come in heat at 11 months of age. The conclusions from this experiment are mainly that sows well fed and well developed and bred at from 6 to 8 months of age and twice yearly thereafter produce larger numbers of pigs and at less cost than sows producing their first litters at from 18 to 20 months of age. The pigs are also ready for market at practically the same time. The breeding of very young sows retards growth, and sows carried on insufficient

rations are later in coming to sexual maturity, fewer pigs are produced, and stunted growth results.

The effect of yeast on feeds and their utilization by fattening swine, L. A. Weaver.—Six lots of 8 pigs each averaging about 126 lbs. in weight were fed on a ration of corn, shorts, and tankage (9:2:1). Two per cent of yeast was added to the rations of lots 3 and 4, and 4 per cent to lots 5 and 6. The rations of lots 1, 3, and 5 were mixed with water just prior to feeding, while the rations of lots 2, 4, and 6 were soaked for 24 hours before feeding. The average daily gains of the 6 lots varied only from 1.5 to 1.6 lbs., thus showing no advantage for the soaking or yeast feeding. Soaked feeds proved to be slightly more efficient as determined by the feed required per unit of gain, the average total difference for all lots, however, being only 13 lbs. per 100 lbs. of gain.

[Feeding experiments with swine at the Minnesota Station] (*Minnesota Sta. Rpt. 1924, pt. 2, pp. 8–13*).—The results of the following experiments are reported:

Are wheat by-products economical substitutes for corn?—In tests of the feeding value of wheat by-products for swine, lots of hogs on alfalfa pasture were given a basal ration containing shelled yellow corn, tankage, and minerals, with supplements of standard wheat middlings, wheat flour middlings, and red dog flour for the other lots. The tankage made up less than 10 per cent of the basal ration and only 5 per cent of tankage was included in the rations containing the wheat mill products. The amounts of tankage were reduced as the experiment progressed. The results showed that the substitution of wheat by-products for approximately one-third of the corn and one-half of the tankage in the ration slightly increased the rate of gain, but somewhat more total feed was required per unit of gain. When the wheat by-product does not cost more per pound than corn, it may profitably serve as a partial substitute in the ration.

Is rye a good hog feed?—Various combinations and methods of feeding rye to pigs have been tested. Three lots of pigs fed rye, tankage, and minerals in dry lot, and a fourth lot receiving the same feeds with rape pasture, gained normally for from 4 to 6 weeks, after which the rate of gain decreased and finally no further gains were made. Some of the pigs scoured badly. No improvement resulted from supplements of butter, casein, and cod liver oil. When 50 per cent of barley or 50 per cent of corn was added to the ration, satisfactory gains were made except in the dry lot feeding with corn. Buttermilk also made a satisfactory supplement, but oats and alfalfa were unsatisfactory.

Commercial buttermilk products for growing pigs.—Semisolid buttermilk and dried buttermilk have been compared with fresh buttermilk and tankage for feeding 75-lb. pigs to 175 lbs. in weight. Both dried products proved equal to fresh buttermilk and superior to tankage. Their cost, however, is a factor which tends to limit their use.

Protein supplements for suckling pigs.—Rations of shelled corn, red dog flour, and skim milk; shelled corn, red dog flour, and tankage; and shelled corn and red dog flour were compared for suckling pigs over 30 days of age. The average daily gains per head made on the respective rations were 0.75, 0.55, and 0.45 lb. The pigs were continued on the same rations for 30 days following weaning with similar results except that the pigs receiving no high protein stopped growing and became runty and unthrifty.

Protein supplements for weaned pigs.—In comparing various protein supplements for 40-lb. pigs, average daily gains made on the different rations fed in separate self-feeders were as follows: Shelled corn, flour middlings, and skim

milk 0.93 lb.; shelled corn, flour middlings, and tankage 0.71 lb.; and shelled corn, flour middlings, and tankage with rape pasture 0.89 lb. per head. Skim milk or pasture, if not available, could be most nearly replaced by green clover, green alfalfa leaves, or ground alfalfa.

Improving a corn and tankage ration, W. L. Robison (*Ohio Sta. [Leaflet, 1924], p. 1*).—Eight lots of 6 pigs each, averaging approximately 45 lbs. in weight, were selected for comparing the addition of various products to a corn and tankage and a corn and skim milk ration. All pigs were fed until an average of 150 lbs. of gain had been made per head. The rations used and the average daily gains produced during the experiment were as follws: Corn and tankage, 0.82 lb.; corn, tankage, and alfalfa meal, 0.86; corn, tankage, alfalfa meal, and linseed meal, 1.04; corn, tankage, and calcium carbonate, 0.88; corn, tankage, calcium carbonate, and rice polish, 1.00; corn, tankage, calcium carbonate, and skim milk, 1.22; corn, calcium carbonate, and skim milk, 1.11; and corn, alfalfa meal, and skim milk, 1.10 lbs.

The author concludes that some advantage seems to have resulted from the addition of most of the supplements to the corn and tankage ration. This was especially true of the skim milk.

Efficient supplements for pigs (*Wisconsin Sta. Bul. 373 (1925), pp. 89–91*).—The results of the following experiments with swine are briefly noted, some of which are continuations from the previous year (E. S. R., 51, p. 469):

Linseed meal-tankage combination excels.—The combined results of six experiments carried on since 1919 have demonstrated the superiority of linseed meal and tankage in equal parts as supplements to corn for pigs on pasture. The gains are not only greater than when tankage alone is used, but less feed is required per unit of gain.

Other combinations.—The use of corn germ meal when mixed with tankage has not been as efficient as tankage alone or tankage and linseed meal. Wheat middlings has not been as satisfactory as tankage and linseed meal.

Skim milk for pigs.—By averaging the results of 12 experiments conducted at the Wisconsin and other stations, 100 lbs. of skim milk was found to be equivalent to 10.86 lbs. of corn plus 7.29 lbs. of tankage for pigs fed well-balanced rations of yellow corn and tankage without pasture. In trials with pigs on pasture, 100 lbs. of skim milk was found equivalent to 7.2 lbs. of corn plus 4.8 lbs. of tankage.

Feeding fall pigs.—Comparisons of a ration of corn and tankage with one of corn, tankage, linseed meal, and chopped alfalfa hay for fall pigs showed that the average daily gains on the former were 0.96 lb. and 1.15 lbs. on the latter. The feed required per unit of gain was also decidedly less on the latter ration.

Improving yellow corn and skim milk.—In two experiments, fall pigs receiving a ration of corn, linseed meal, chopped alfalfa, and skim milk made average daily gains of 1.11 lbs. per head as compared with 0.96 lb. gain by pigs receiving corn and tankage. Corn, skim milk, and chopped alfalfa gave better results than corn and skim milk, but not as good results as when linseed meal was included in the ration.

[Horse feeding experiments at the Missouri Station], E. A. Trowbridge et al. (*Missouri Sta. Bul. 228 (1925), pp. 34, 35, 41, 42*).—The results of experiments in growing draft colts and wintering idle brood mares are briefly reported.

Growing draft colts, D. W. Chittenden and E. A. Trowbridge.—In continuing this experiment (E. S. R., 51, p. 775), data are reported on the feeding of 4 fillies and 3 horse foals from idle mares during the suckling period, averaging 145 days, and during the weanling period of 218 days. An average gain of

411 lbs. was made per head during the suckling period, when an average of 16 lbs. of ground corn, 16 lbs. of ground oats, and 8 lbs. of bran were consumed, with pasture at will. The colts were fed in 2 lots during the weanling period, the first group receiving a full grain and alfalfa-hay ration, while the second group received alfalfa hay at will and one-half the amount of grain consumed by the former group. The average gains made in the 2 lots were, respectively, 396.5 and 287.3 lbs. per colt. The former group consumed an average of 1,483 lbs. of hay and 1,953 lbs. of grain, as compared with 2,047 lbs. of hay and 1,078 lbs. of grain consumed by the colts receiving the limited grain ration.

Wintering idle brood mares on blue-grass pasture supplemented with oat straw and limited grain ration, D. W. Chittenden.—This experiment deals with the wintering of idle brood mares from the time that their colts were weaned on October 5, 1923, until May 4, 1924. Blue grass pasture was provided until December 21, after which 1 lb. of grain (equal parts bran, oats, and linseed oil meal) and 5 lbs. of oat straw were fed daily. The grain was increased to 3 lbs. daily per head on January 7, and on January 19 3 lbs. and on January 26 6 lbs. of shelled corn were added to the daily ration. The mares averaged 43 lbs. heavier at the close of the wintering period. It is pointed out that the winter was unusually severe.

[Poultry experiments at the Missouri Station], H. L. KEMPSTER ET AL. (*Missouri Sta. Bul. 228 (1925), pp. 66–69*).—The results are reported of the following experiments, many of which are continuations of those previously noted (E. S. R., 51, p. 776).

Time of molt as an index to productivity of hens, H. L. Kempster.—A classification of the time of molting with reference to the winter and annual egg production of White Leghorns showed that those which had completed the molt on November 1 were decidedly the poorest producers, both in annual and in winter production. Those in full molt at this time were slightly better, while those showing no trace of molt were decidedly the best annual and winter egg producers. A classification of the month in which hens quit laying showed that early quitters were poor annual and winter egg producers, the average winter and annual production of birds quitting in July being 18 and 100 eggs, respectively, while those quitting in December laid an average of 33.8 eggs during the winter and 148 eggs during the year.

Value of sour milk, beef scrap, cottonseed meal, gluten meal, and oil meal in rations for egg production, H. L. Kempster and E. W. Henderson.—The effects of various sources of protein on egg production were tested by feeding mashes containing from 5 to 20 per cent of tankage or meat scrap and comparing with the production on mashes in which from 5 to 15 per cent of this animal protein was replaced by cottonseed meal. Other lots received 35 per cent of dried buttermilk, and sour milk. The average annual egg production on the rations containing the different percentages of high protein feeds in the mash was as follows: Tankage 20 per cent, 122 eggs; meat scrap 20 per cent, 120; dried buttermilk 35 per cent, 96; tankage 15 per cent, 123; tankage 15 and cottonseed meal 5 per cent, 121; tankage 10 and cottonseed meal 10 per cent, 102; tankage 10 per cent, 112; tankage 5 and cottonseed meal 15 per cent, 93; tankage 5 per cent, 85; and sour milk, 120 eggs.

Correlation of sexual maturity to annual egg production, H. L. Kempster.—In studying the relation between the rate of attaining sexual maturity and the annual egg production in White Leghorns, a correlation of -0.1934 ± 0.043 was obtained. It was shown that the birds maturing in from 200 to 224 days made the best annual records. Those maturing in less than 200 days laid

during the early fall and went into a winter molt, which greatly handicapped the production.

Time of hatching in relation to egg production, H. L. Kempster.—A study of the winter and annual egg production of White Leghorns has shown very little difference between those hatched in February, March, April, or May.

Rate of growth of chicks under normal conditions, M. A. Seaton.—A tabulation of the average weekly weights of chicks of the following breeds: Rhode Island Reds, Buff Rocks, White Rocks, Barred Rocks, Rhode Island Whites, Anconas, and White Leghorns.

The value of sour skim milk and beef scrap in rations for growing chicks, and the cost of growing chicks, E. W. Henderson.—In experiments in which milk products which had previously been frozen were fed as the sole source of animal protein to growing chicks, no deleterious effects were observed from the freezing of the product.

Influence of time laying starts to future production, H. L. Kempster.—A study of the relation between the winter and annual egg production and the month in which laying starts has shown no object for delaying the rate of sexual maturity in Leghorns. A few birds starting in July and August were not high producers, but those beginning to lay in September averaged 44 and 186 eggs during the winter and the year, respectively. Fewer eggs were produced by those starting later in the season.

[Comparisons of protein supplements for baby chicks] (*Minnesota Sta. Rpt. 1924, pt. 2, pp. 36–38*).—The results of two experiments are briefly reported.

Will dried buttermilk replace bugs, worms, and meat scraps for chicken feed?—Lots of 40 chicks each were used for comparing the feeding value of mash containing varying percentages of dried buttermilk and wheat bran. The scratch feed consisted of cracked corn, cracked wheat, and oatmeal, 2:2:1. When less than 12 per cent of the total concentrates consisted of dried buttermilk, the mortality of the chicks averaged 41.2 per cent and the average weight of the chicks 354.5 gm., but when the mash was from 12 to 18.5 per cent dried buttermilk the loss was reduced to 10.4 per cent and the average weight increased to 422.7 gm. The loss was 25 per cent in lots receiving buttermilk without bran or a mash of beef scrap and bran, and the average weights were, respectively, 362 and 421.5 gm.

Liquid milk by-products as substitutes for dry mash in the feeding of young chicks.—Lots of chicks were used for comparing various dairy by-products with a mash composed of 70 per cent bran and 30 per cent meat scrap for raising chicks when supplemented with a scratch feed of cracked grain and small seeds. The gains in live weight ranked in the following order with the different rations: Beef scrap mash, sweet skim milk, sour skim milk, buttermilk, and sweet whole milk.

Standard methods of feeding laying stock, F. H. Clickner (*New Jersey Stas. Hints to Poultrymen, 13 (1925), No. 9, pp. 4, fig. 1*).—A summary of methods of feeding for egg production, based on the experiences of commercial poultrymen in New Jersey and the results of the Vineland and Bergen County egg-laying contests. Average scratch and mash consumption for egg production are tabulated during the different seasons.

DAIRY FARMING—DAIRYING

[Feeding experiments with dairy cattle at the Wisconsin Station] (*Wisconsin Sta. Bul. 373 (1925), pp. 86, 87, 92*).—The results of the following experiments are briefly noted:

Cause of failure on 1907 "balanced wheat ration."—The addition of 2 per cent bone meal, 2 per cent cod liver oil, and common salt to a ration of wheat straw and wheat gluten was found by E. B. Hart to improve this ration so that normal growth and reproduction could occur. This was the same basal ration that was used solely from the wheat plant in experiments conducted in 1907 from which unsatisfactory results were obtained. The blindness of the calves in those experiments was due to a lack of vitamin A, while the tetanus was due to a calcium deficiency. The cause of the expulsion of the fetuses in the earlier experiments is unknown.

Effect of roughage from acid soil on reproduction.—The inability of cows to produce living calves when fed only timothy hay from the Buena Vista marsh has been remedied by Hart through the addition of 2 per cent of bone meal, due to its supplemental effect on the calcium of the ration.

Soy beans v. alfalfa hay for dairy cows.—In further comparisons of soy bean and alfalfa hay (E. S. R., 51, p. 474), two lots of 5 cows each were fed by the double reversal method. As in the preceding trial, the alfalfa hay was all consumed, while 19.2 per cent of the soy beans were refused. The average daily milk produced was 0.74 lb. less on the soy bean hay ration, but the fat percentage was 0.13 per cent higher. The weights were maintained somewhat better on alfalfa hay. A further trial in which the soy bean hay was cut gave practically the same results, though in this trial this feed was completely consumed.

Suggestions for computing rations for dairy cows, I. McKellip and S. M. Salisbury (*Ohio Agr. Col. Ext. Bul., vol. 17, No. 1, rev. (1923), pp. 16*).—Directions for feeding dairy cattle.

Minimum protein requirements for the growth of dairy heifers, A. C. Ragsdale and W. P. Hays (*Missouri Sta. Bul. 228 (1925), p. 46*).—Three calves and one yearling heifer have been fed a ration containing only sufficient milk protein to promote normal growth. The supplementary ration to 6 months of age and the sole ration thereafter consisted of skim milk powder, starch, sugar, cod liver oil, bone ash, iron oxide, and cellulose. The results indicate that cellulose may be a limiting factor in this ration. In similar experiments guinea pigs have made normal growth to sexual maturity on a mixture of ground corn 40 per cent, alfalfa meal 40, wheat bran 10, and oil meal 10 per cent, reduced to a 10 per cent protein plane by the addition of starch. No reproduction has yet occurred.

Milk substitutes in the rearing of young calves, J. B. Lindsey and J. G. Archibald (*Massachusetts Sta. Bul. 223 (1925), pp. 41–51*).—The results of tests of the comparative value of 7 calf meals and skim milk, skim milk and cornstarch, and skim milk powder and cornstarch for raising 45 calves are briefly reported. The calf meal which seemed to give as good results as any consisted of 45 parts of ground rolled oats, 20 parts of skim milk powder, 10 parts of linseed meal, 14 parts of cornstarch, 5 parts of corn sugar, 5 parts of alfalfa flour, 0.5 part of calcium chloride, and 0.5 part of salt. The chief differences in the other meals were that skim milk powder was replaced by soluble blood flour in one, while blood flour and skim milk powder were both included in another. In others milk sugar replaced the cornstarch or coconut meal, and red dog flour replaced part of the ground oats, or the amounts of alfalfa flour or other ingredients were modified.

The calves received whole milk for from 1 week to 10 days of age, after which this substance was gradually replaced by skim milk, which in turn was gradually replaced by a gruel after from 2 to 3 weeks. The gruel was made by stirring 3.5 oz. of the calf meal to be tested into a quart of cold water and

heating it to approximately 150° F. Skim milk powder seemed to be a promising substitute for calf meal. The experiment also showed that fairly good growth could be produced in calves by the careful use of calf meals.

Hygienic milk regulations for the city of Buenos Aires [trans. title], F. A. SILVA BARRIOS (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 429 (1925), pp. 32, pls. 2, figs. 6*).—A discussion of milk regulations, pointing out the desirability of sanitation and pasteurization.

The effect of certain methods of handling clean cream on its grade, N. JAMES (*Sci. Agr., 5 (1924), No. 4, pp. 117–125, figs. 2*).—The results are given of a practical test conducted at the Manitoba Agricultural College to determine the change in grade of cream held for different periods in ice water ranging from 34 to 60° F. in temperature, in cooled water ranging from 49 to 64°, and in a room ranging from 44 to 76°.

The test showed that the cream tended to deteriorate more rapidly at the higher temperatures. Cooling each day's cream prior to adding it to the large batch from day to day and stirring had only a slight effect in maintaining a better quality as the deterioration with age occurred. When the cream was sweet very little difference could be detected between cooled and stirred cream as compared with that added to the batch without previous cooling and stirring, though the acidity was invariably from 0.01 to 0.02 per cent higher. Rich cream was found to keep better than thinner cream. Storing cream in a rusty can tended to produce metallic flavors, which were especially pronounced as the acidity developed. The exposure of cold cream to warmer conditions, as in transit, tended to lower the grade slightly, especially when the acidity was high.

On lactic acid fermentation, I [trans. title], A. I. VIRTANEN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 143 (1925), No. 1–3, pp. 71–78*).—The operation of a coenzyme in lactic acid fermentation by *Bacillus casei* ε was indicated as in earlier experiments (E. S. R., 52, p. 879) by its inability to form zymophosphates from $Mg_2P_2O_7$ and glucose when the dried bacteria were washed with water, but the activity was again restored when some of the wash water was added to the media. Similar results occurred with a strain of *Streptococcus lactis* but the action was not so strong.

The bactericidal property of milk, F. S. HANSSEN (*Brit. Jour. Expt. Path., 5 (1924), No. 5, pp. 271–280*).—In experiments conducted at F. G. Gade's Pathological Institute, Bergen, Norway, the bactericidal properties of about 70 samples of milk were tested, using *Bacillus typhosus* and two strains of *B. paratyphosus*. Bactericidal properties were demonstrated in fresh milk during the first 4 hours at 37° C. (98.6° F.) and for a longer period at room temperature. Such properties were destroyed by heating the milk to 75° for 15 minutes, but milk heated to 70° for the same length of time was still active. It is suggested that the bactericidal properties are in close relation to the oxidizing enzymes in the milk. Much variation was found to exist in the ability of milk to retard bacterial growth during different seasons of the year and in the resistance of different strains of bacteria to this action.

[Experiments with dairy products at the Wisconsin Station] (*Wisconsin Sta. Bul. 373 (1925), pp. 63–66, 72, 73*).—The results of experiments dealing with the manufacture of dairy products are reported, many of which are continuations of those previously noted (E. S. R., 51, p. 476).

Improved Swiss cheese methods (pp. 63, 64).—Studies of Swiss cheese production by J. L. Sammis have indicated the importance of the time of heating the kettle in order to prevent the development of too much acidity. An ordinary acidimeter does not appear to be sufficiently accurate for use in Swiss cheese production. The bromocresol purple test is, therefore, recommended for determining the time at which acidity first begins to increase in

the whey. Overripe milk tends to produce a sour or crumbly cheese. It is pointed out that American cheese can be satisfactorily produced with much less care.

Bacterial studies on "stinker" cheese (pp. 72, 73).—In a study of the cause of stinker cheese by E. G. Hastings and W. C. Frazier, it has been found that a group of organisms which attack protein is responsible. These organisms can develop only in the presence of certain gas-forming bacteria and more especially in connection with those producing butyric acid and those which cause nissler cheese.

Cause and prevention of the cream plug (pp. 64, 65).—Studies by H. H. Sommer and K. M. Royer of the tough layer forming on cream after standing have shown that this layer has a fat content of from 55.4 to 79.8 per cent, and a microscopic examination showed that the fat globules had largely coalesced. Agitation of the cream, especially at low temperatures, tended to increase the formation of the plug. It is recommended that cream be agitated as little as possible and that where partial churning has occurred the cream be emulsified or homogenized.

Neutralizing acid cream in buttermaking (pp. 65, 66).—L. C. Thomsen divided sour cream into three lots for a test of the effect of neutralizing this cream on the quality of the butter produced. One lot was churned unaltered, another lot was pasteurized, and the third lot was neutralized and pasteurized before churning. The scores of the fresh and stored butter indicated that neutralization materially improved the keeping quality of the butter held in cold storage, but with storage temperatures of from 30 to 42° F. neutralization tended to lower the keeping quality. In other studies pasteurization was found to improve the keeping quality of butter, but tended to reduce the score of the fresh butter made from very sour cream.

Making and using cottage cheese in the home, K. J. MATHESON and J. M. HOOVER (*U. S. Dept. Agr., Farmers' Bul. 1451 (1925), pp. II+14, figs. 6*).—This describes the manufacture of cottage cheese and its use in various forms and as ingredients of various dishes. It supersedes Farmers' Bulletin 850 (E. S. R., 38, p. 78) and Office of the Secretary Circular 109 (E. S. R., 39, p. 267).

"Fruitiness" in whey, E. R. HISCOX and K. LOMAX (*Ann. Appl. Biol., 11 (1924), No. 3-4, pp. 503-513*).—The authors have reported the results of a bacteriological and chemical study, conducted at the National Institute for Research in Dairying at Reading, of the cause of the occurrence of a characteristic fruity smell in whey. Microscopic studies showed the presence of cocci, bacilli, and yeasts. Pure cultures of a yeast and a bacillus were obtained from this whey which when acting together produced a similar condition in milk. The bacillus resembled *Bacillus bulgaricus* but grew very sparingly on artificial media, whey agar being the only solid medium giving satisfactory results.

The chemical studies showed that the symbiotic relation was due to the inability of the yeast to ferment lactose, this product being first broken down by the bacillus into simpler sugars which were then available for yeast fermentation. The fruity odor was due to the mixture of alcohol, actetic acid, and acetaldehyde, the latter product resulting from the oxidation of ethyl alcohol by the yeast. A vigorons culture of *B. bulgaricus* and the yeast produced the same characteristic fruity odor in cheese.

The texture of ice cream, A. C. DAHLBERG (*New York State Sta. Tech. Bul. 111 (1925), pp. 3-42, pls. 4, fig. 1*).—Microscopic studies of ice cream have shown much variation in the diameter of the air cells incorporated. Such variations did not appear to be associated with the composition of the product, but homogenization and proper freezing tended to reduce the size of the air

cells. Newly frozen and hardened ice creams having smooth and coarse textures were examined microscopically, but practically no uniform differences were observed just after freezing. After hardening, however, the air cells in the smooth product retained their shape, while in the coarse product they were much distorted by pressure resulting from the formation of ice crystals. Preliminary results of the microscopic studies were previously noted (E. S. R., 50, p. 782).

In studying the effect of the various ingredients on texture, water ices were prepared containing from 15 to 75 per cent of sugar. In these experiments the sugar content appeared to have little effect on the texture when the product was agitated during freezing. The hardening of water ices was inducive to supercooling and the water froze out, leaving a high concentrated sugar product which would not freeze.

The effects of gelatin were studied in ice cream and in water ices. The results of these studies indicated that gelatin tends to prevent ice crystallization through the formation of a gel. Gel formation was aided by casein if insufficient gelatin was present.

The effect of milk solids on the development of ice crystals was studied with relation to the effect of milk fat in water ices, the effect of milk solids-not-fat in water ices, and the combined effect of fat and solids-not-fat in ice cream. Fat was concluded to prevent the formation of ice crystals by mechanical obstruction, as a smooth product was frozen containing 30 per cent of fat, 13 per cent of sugar, and 0.3 per cent of protein. A sugar solution containing 30 per cent of milk solids-not-fat was frozen and appeared smooth, but after hardening it was nearly as coarse as the product would have been expected to be without the addition of any milk solids.

Less fat was required to produce a smooth product in the experiments with normal ice cream when some milk solids-not-fat were included, indicating an associative action of these two products. Milk solids-not-fat were also found to assist in the formation of a gel with gelatin, but the fat had no influence. Homogenization helped to produce a smooth product in the presence of fat and milk solids-not-fat by lowering the amount of gelatin required in the production of a gel and increasing its firmness, thus reducing the water available for the formation of large crystals.

An accurate method of calculating ice cream mixes, G. D. Turnbow and C. M. Titus (*Hilgardia* [*California Sta.*], *1* (*1925*), *No. 4*, *pp. 57–79*).—An algebraic method of calculating the ingredients of ice cream mixes is presented. The general formulas necessary are as follows:

$$Z=\frac{10\ (b-a)+10.5\ (d-e)-.82\ (bd-ae)}{c\ (b-a)+h\ (d-e)-k\ (bd-ae)}\times M.$$

$$Y=\frac{(10.5-.82a)M+akZ-hZ}{b-a}.$$

$$X=\frac{10.5M-bY-hZ}{a}.$$

The symbols have the following meaning: M equals pounds of mix to be prepared, X number of pounds of a per cent milk required, Y number of pounds of b per cent cream required, Z number of pounds of c per cent condensed milk required, d per cent milk solids-not-fat in milk or skim milk, e per cent milk solids-not-fat in cream, h per cent of fat in the plain condensed or sweetened condensed whole milk, and k equals the difference between 100 and the percentage of sugar in the sweetened condensed whole or skim milk.

VETERINARY MEDICINE

[Work in veterinary medicine at the California Station] (*California Sta. Rpt. 1924, pp. 57–59*).—Investigations of a serious disease of poultry resembling roup, which has been demonstrated to be a deficiency of vitamin A, have been previously noted from Bulletin 378 (E. S. R., 52, p. 77). In an intensive study of blackhead in turkeys, by H. W. Graybill, rectal injections of carbon tetrachloride proved highly effective in removing cecum worms (*Heterakis vesicularis*), and rectal injections of Blackleaf 40 were also effective, although, on account of its high toxicity, its value is limited. Oral administration of carbon tetrachloride was highly effective against the intestinal roundworm [*Ascaridia perspicillum*], but ineffective against the cecum worm. Tobacco dust was less effective against the intestinal roundworms and no more effective against the cecum worm. A survey of the turkey-raising district has shown that there are several diseases other than blackhead that are responsible for large annual losses. Fowl typhoid has been found to be especially serious.

Very promising results have been obtained in the control of coccidiosis in young chicks by changing the H-ion concentration of the contents of the ceca through dietary means. Work on the immunity and the carrier problem in bovine abortion, previously reported upon by Hart and Traum (E. S. R., 53, p. 180), is briefly referred to.

[Report of the Minnesota Station] veterinary division (*Minnesota Sta. Rpt. 1924, pt. 2, pp. 23–35, figs. 5*).—An account is first given of work with bovine infectious abortion and means for its control. Investigations extending over a period of five years show that living vaccine produced some immunity in this disease in the bovine, the extent of immunity varying with the animal, some becoming highly immune and others scarcely at all. The observations indicate that the number of cases of white scours in calves is not affected by the use of abortion vaccines or bacterins.

Reference is next made to investigations of the results of continuous feeding of sweet clover hay, which have shown an exclusive diet of it to result seriously through its effect upon the blood. Two yearling heifers that were fed an exclusive diet of sweet clover hay died in a little over a month. It is believed that losses from feeding sweet clover hay may be avoided by feeding the hay in limited quantities and with other feeds. The conclusion that only occasional lots of sweet clover hay will cause the disease seems to be justified, some investigators being of the opinion that the affection is due to certain molds, although there is no definite evidence justifying such an opinion.

The effect of tuberculosis upon the poultry industry is discussed, it being pointed out that this disease affects more than 25 per cent of the flocks of the State. It is concluded that less than 1 per cent of the eggs from tuberculous fowls actually contain living tubercle bacteria. No tubercle bacilli were found on the soiled shells of 209 eggs examined.

The value of the tuberculin test in control work with cattle is discussed. A disease of the bones and joints of growing pigs and shotes, reported from many parts of the State, appears to be due to the lack of lime in the food. It is pointed out that if lime is lacking in the ration the disease may be expected to cause weakness, lameness, and what may be called paralysis.

The occurrence of bacillary white diarrhea of chicks in the State, stomach worms of sheep, and goiter are referred to.

[Work in veterinary medicine at the Nevada Station] (*Nevada Sta. Rpt. 1924, pp. 19–21, fig. 1*).—Brief reports are made of work done on the following projects:

The problem of an unidentified hemorrhagic disease in cattle, E. Records and L. R. Vawter.—An organism discovered by the authors during the year, which appears to be the cause of this disease, was found repeatedly in the heart and other organs of cattle dead or dying from it. "Suitable methods were developed in laboratory for growing this organism artificially and for testing its properties with the smaller experimental animals, rabbits, and guinea pigs. As a direct result of the final isolation of the organism which causes the disease, it was possible in the course of the year to develop a serum whose curative properties are higher than those of any other preparation of the kind thus far tested."

The problem of the poisonous plants of the sheep and cattle ranges, C. E. Fleming, M. R. Miller, and L. R. Vawter.—Investigations made of the common chokecherry of the mountain canyons showed the leaves of this common shrub to be highly poisonous from early summer until the time they begin to turn yellow in the autumn. The active poisonous principle is very similar to hydrocyanic acid, and the symptoms of poisoning are similar. There is little difference between the dose which will merely make the animal sick and the quantity required to kill. The poison appears to be rapidly eliminated by the animal and not to accumulate, since several times the quantity of leaves required to kill may be consumed in the course of a day without any apparent injury. The remedies usually employed for hydrocyanic acid poisoning are of no value in chokecherry poisoning, and there is no hope of cure after the animal has eaten the fatal dose.

A brief reference is made to tests and observations of the effect of alkali water upon livestock.

[Work in veterinary medicine at the Wisconsin Station] (*Wisconsin Sta. Bul. 378 (1925), pp. 73–79, figs. 2*).—In investigations of abortion bacteria by F. B. Hadley, B. L. Warwick, and E. M. Gildow, in which the effect of bovine and porcine strains was tested on rabbits, guinea pigs, and mice, an appreciable difference was detected, the organism from swine being found more virulent and to have a greater pathogenicity than that from bovines. When injected into guinea pigs the porcine strain caused a great loss of weight, usually a significant temperature reaction, and in some cases the death of the animal, whereas the bovine type failed to cause a loss in weight in rabbits and guinea pigs. While there was some variation in the effects produced upon pregnant does, virulent strains of the organism when injected into does pregnant from 14 to 20 days produced dead or undeveloped young, most of which were expelled before the end of the normal gestation period. The incubation period of the abortion disease in these animals varied from 7 to 17 days with the virulent strains of the organism.

Work by Hadley and Gildow has shown the abortion vaccine to have enough value to warrant its use in herds where the blood test has shown the infection to exist. It has, however, been found safe only to vaccinate open or nonpregnant cows and heifers, and after this is done breeding should be postponed for at least two months. Vaccination work by Hadley and B. A. Beach with live abortion bacilli of porcine origin led to the conclusion that this is probably an effective method of preventing natural infection in swine. It does not control the disease when large doses of abortion bacilli are introduced into the blood. The vaccination of open sows and gilts is ordinarily harmless, though some animals fail to breed afterward. The work indicates that the vaccine should be introduced intravenously rather than subcutaneously.

Investigations by Beach of a disease of western lambs being fattened for market resulted in the isolation of *Vibrion septique* from the carcasses. A

filtrate similar to that used for immunizing cattle for blackleg was produced, which gave satisfactory results, reducing losses to a very low percentage.

A skin disease affecting newborn calves, first observed by Hadley in 1912, has since been observed in 41 calves in 12 different herds. In this disease, newborn calves, though carried to maturity, have certain skin defects. Whole areas are entirely devoid of skin and hair, the skin around the mouth, ears, and legs usually peels off, and the lining membranes of the mouth appear raw. The disease was found to be confined wholly to newborn calves, and it has been observed only in certain families of grade and purebred Holsteins, apparently being limited to herds in which these blood lines predominate.

Investigations of the roundworm *Belascaris marginata* in foxes, by Hadley, Warwick, Gildow, and Beach, show the larvae to migrate from the intestines to the blood stream, then to the liver, heart, and lungs, whence they pass up the windpipe and are swallowed, again reaching their place of hatching, where they develop into mature worms. Microscopic examination showed well-developed roundworm larvae to occur in the lungs of newborn fox pups, indicating that infestation must have occurred before the pup was born, the small worms having crossed from the mother to the young through the placenta.

Brief reference is made to studies of roundworms of pigs, stomach worms of lambs, and intestinal worms of poultry. The detection of *Bacterium pullorum* in chicks from 22 of 57 farms is reported upon, as is preliminary work with the avian type of tubercle bacillus in swine.

Annual administration report of the Civil Veterinary Department in British Baluchistan for the year 1923–24, N. K. Vacha (*Baluchistan Civ. Vet. Dept. Ann. Admin. Rpt. 1923–24, pp. 16*).—This report includes statistical data on the mortality of livestock from infectious and parasitic diseases; the results of preventive inoculation during the year; etc.

The bactericidal properties of the blood of the calf before and after ingesting colostrum, A. C. Ragsdale, S. Brody, and J. B. Nelson (*Missouri Sta. Bul. 228 (1925), pp. 43, 44*).—In a study in which six cows and eight calves were used, the blood serum of the mature cow was found to be bactericidal to *Bacillus coli*, but *B. coli* survived and grew luxuriantly when introduced into the blood serum of the newly born calf. Colostrum was found to be devoid of complement, which is one of the constituents necessary for bacteriolysis. The amount of complement in calf serum at birth was less than one-third that of the cow. The concentration of complement rapidly increased during the first few days, even when no colostrum was ingested, and with the increase of complement there was an increase of bactericidal properties. Thus it was demonstrated that the increase of one of the constituents of the defensive mechanism was more or less independent of the ingestion of colostrum. The agglutinating properties of calf serum, however, were found to be absolutely dependent on the ingestion of colostrum, thus demonstrating that some constituent on which the phenomenon of agglutination is based was derived from colostrum.

The constitution of the d'Herelle bacteriophage [trans. title], P. Hauduroy (*Compt. Rend. Soc. Biol. [Paris], 88 (1923), No. 1, pp. 59, 60*).—It is stated that the phenomenon characterizing the bacteriophage, regarding the supposed nature and characters of which d'Herelle has contributed information (E. S. R., 48, p. 675), is produced by a complex, namely, the bacteriophage properly so-called (admittedly capable of reproducing itself) and the substances given up by the bacteria which may be attacked and broken down by the bacteriophage. The presence of these two together adequately conditions lysis. The nature of the soluble substances present, their mode of union to the bacteriophage, and the relation of such union is as yet entirely unknown.

Studies on the bacteriophage of d'Herelle in different media [trans. title], P. HAUDUROY (*Compt. Rend. Soc. Biol. [Paris], 88 (1923), No. 14, pp. 1084, 1085*).—Studies of three bacterial forms in connection with the bacteriophage noted above gave results considered to show that it plays an important rôle in immunity.

Contagious abortion investigations, J. W. CONNAWAY, A. J. DURANT, and H. G. NEWMAN (*Missouri Sta. Bul. 228 (1925), pp. 84–86*).—The authors conclude that this disease in swine conforms closely to the Bang abortion disease in cattle as regards the cause, transmission of infection, and transmission of the specific abortion antibodies to the newborn pigs through the ingested colostrum. The specific abortion antibodies occasionally pass from the blood of the mother to the young in utero. Properly checked cases were observed in which abortion antibodies were found in the blood serum prior to nursing. This is thought to be due to a lesion of some extent present in the placental tissues, which permitted a leakage of the indiffusible antibodies, or, more likely, their transfer from the mother to the offspring from the inflamed placental area by migrating leucocytes which had produced or imbibed the *Bacillus abortus* antibodies.

The transmission of hemolysin from sows to nursling pigs through the colostrum was demonstrated, as was the simultaneous transmission of *B. abortus*. In no case was there any evidence that hemolysin had been acquired by any pig in utero. It does not appear that protein thereby will prove of value in destroying the *B. abortus* microbe, although such treatment may activate the normal defenses against infections in general. The intravenous method of injecting protein was attended with some danger.

It is pointed out that the results obtained by the authors agree with those of other investigators who have studied different species. Certain phenomena related to the production and distribution of immune bodies are not, however, in seeming accord, since in the case of hemolysin a greater amount was stored in the blood than in the colostrum, while in the case of the *B. abortus* antibodies a greater quantity was stored in the colostrum than in the blood. This is probably due to the fact that the udder is a favorite and, as a rule, constant habitat for *B. abortus* in the infected female. It is concluded that, with respect to the production of hemolysin, the spleen is the important organ involved.

"The serological reaction of 99 litters of pigs farrowed by sows which were carriers of abortion infection shows that the duration of the passive reaction induced by ingestion of the colostrum was of much longer duration in the litters that were farrowed during the early years of the herd infection. The duration of this phenomenon appears to be dependent upon the quantity of the antibodies ingested with the colostrum. The greater the amount of the antibodies ingested the longer the reaction persists. As the serological reaction of the infected sows becomes weaker or variable, the duration of the passive reaction in the offspring became less. These studies on swine abortion supply an explanation of why in cattle herds, in which great losses occur for a time, the disease apparently dies out for a considerable time, or until new infection is brought into the herd."

Recent Bureau of Animal Industry Experiment Station bovine infectious abortion studies, E. C. SCHROEDER and W. E. COTTON (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 5, pp. 550–561*).—The studies covered in this report are as follows:

Infection via the eye.—Attention is called to previous work in which it was demonstrated that guinea pigs could be infected with *Bacterium abortum* by dropping a small quantity of a saline suspension of the organism in the eye.

In a later study, 65 out of 74 guinea pigs thus exposed to a fairly virulent culture of the bovine type developed abortion lesions. An experiment is reported showing that this mode of infection is possible in cattle. One drop of a virulent bovine strain of *B. abortum* was dropped in one eye of a pregnant heifer negative to the agglutination test. This heifer was then placed in the same pen with another pregnant heifer also negative to the agglutination test. The control heifer calved normally and remained negative, while the inoculated heifer aborted 54 days later. The retained afterbirth and the organs of the dead calf were found to contain *B. abortum*. The blood reaction of this heifer changed from negative to positive at a dilution of 1:400 at the time of aborting and later to 1:800. The colostrum was positive at a dilution of 1:1,600, and the milk was also infected. Negative results were obtained in similar efforts to infect 4 pregnant sows with *B. abortum* of swine origin. This mode of infection is considered to be a possible one in practice.

"The importance of the eye as a portal of entry for the *B. abortum*, of course, we do not know, but, if we take into account the small amount of suspension with which the heifer was successfully infected, it would seem that discharges from infected cows at the time of abortions and parturitions may easily be sprayed into the eyes of susceptible cattle in sufficient amount to infect them. Likewise, drops of dew or rain splashed or sprayed into the eyes from grass or weeds during pasture on freshly infected fields may be dangerous. Less probable, but not wholly to be ignored, is the possible danger from dust, as we do not yet know how quickly the *B. abortum* is killed by drying."

Cattle and swine strain of the B. abortum.—Additional work on the relation of cattle and swine strains of *B. abortum* (E. S. R., 48, p. 380) is reported which indicates that the two strains are not identical but are in some respects as dissimilar as the human, bovine, and avian types of the tubercle bacilli. The swine type is shown to be of extremely low virulence to cattle. Concerning the relation of each type to its host, it is suggested that boars may be a more important factor in the dissemination of swine abortion than bulls of cattle abortion, and that there is some evidence that the organism may be present in the ovaries of infected sows, while it has never been found in the ovaries of infected cattle.

Possible dependence of bovine and swine strains of the B. abortum on environment.—The results thus far obtained in passing cattle strains of *B. abortum* through swine and swine strains through cattle indicate no modification of either strain. This is considered to signify that the strains which attack cattle are of little or no significance for swine and vice versa.

Guinea pig studies on immunization.—A brief report is given of a series of immunization experiments conducted on guinea pigs with an attenuated strain of bovine abortion organisms. A considerable degree of immunity against both bovine and swine strains was secured. This immunity began to decline in about 3 months. The advisability is suggested of testing similar methods on cattle and swine during pregnancy.

Agglutination reactions and their significance.—Further data have confirmed the previous conclusion (E. S. R., 51, p. 281) that cows which react to the agglutination test in a dilution of 1:100 or less do not have infected udders, and that a large proportion of cows reacting in a dilution of 1:200 or more have infected udders. It is emphasized, however, that a low reaction does not necessarily mean that a cow is safe or dangerous as far as the dissemination of abortion organisms is concerned. The necessity of standardizing the agglutination and complement fixation tests is emphasized.

A third note on the piroplasmoses of sheep in Algeria.—The true piroplasmosis: Piroplasma ovis n. sp.—Comparison with Babesiella ovis

[trans. title], F. LESTOQUARD (*Bul. Soc. Path. Exot., 18 (1925), No. 2, pp. 140-145, fig. 1*).—Continuing the investigations previously noted (E. S. R., 53, p. 183), the author concludes that two hematozoa of large size, Piroplasma and Babesiella, occur in Algerian sheep. It thus appears that sheep in Algeria may be infected by five different forms, namely, *P. ovis* n. sp., *B. ovis*, *Gonderia ovis*, *Theileria ovis*, and *Anaplasm ovis*.

Fowl plague: Its cause, symptoms, and control, F. R. BEAUDETTE (*New Jersey Stas. Hints to Poultrymen, 13 (1925), No. 8, pp. 4*).—A brief practical summary of information.

Blood pressure and its application in canine practice, J. G. HORNING and A. J. MCKEE (*Vet. Med., 20 (1925), No. 4, pp. 152, 153, fig. 1*).—This paper includes a table giving averages based upon a series of observations made to determine the normal blood pressure of dogs.

Parasites and parasitic diseases of dogs, M. C. HALL (*U. S. Dept. Agr., Dept. Circ. 338 (1925), pp. 28, figs. 32*).—A practical summary of information.

The occurrence of cuterebrid larvae in dogs and cats, and the possible modes of infection, M. C. HALL (*Jour. Econ. Ent., 18 (1925), No. 2, pp. 331-334*).—This is a summary of information on the subject.

The influence of low and very low temperatures on parasitic nematodes [trans. title], P. H. VAN THIEL (*Tijdschr. Vergelijk. Geneesk., 11 (1925), No. 2, pp. 111-124*).—The author concludes that the fact that some microorganisms can live longer in liquid air than at a temperature of about —20° C. does not apply to larvae of *Trichinella spiralis* (encapsulated in the meat of guinea pigs) and encysted larvae of *Anchylostoma caninum* and of *Strongyloides stercoralis*. "While all larvae of Trichinella and of Strongyloides die in liquid air, a very small part (0.06 to 0.93 per cent) of the larvae of Anchylostoma remain living. This part is smaller in proportion as the time of refrigeration is longer (28 days: 0.06 per cent). After a refrigeration of 28 days at —10 to —15°, 15 per cent of the same larvae are still living." Melting ice appears to have a conserving action upon the larvae of *A. caninum*, since 4 per cent of the larvae are still living after 8 months.

AGRICULTURAL ENGINEERING

Agricultural engineering [studies at the Missouri Station], J. C. WOOLEY and M. M. JONES (*Missouri Sta. Bul. 228 (1925), pp. 29, 30, figs. 2*).—Progress results of a study of methods of prolonging the service of wood fence posts (E. S. R., 48, p. 885) showed that setting in gravel and charring did not pay, while painting with hot carbolineum was perhaps better than painting with creosote. Double tank treatment with creosote was the most effective, the 5-hour treatment being better than the 2-hour. It did not pay to treat some varieties, particularly honey locust, willow, cottonwood, and white oak, unless the whole post was treated. Black ash, sassafras, red oak, and ironwood made good posts if given the double tank creosote treatment.

Progress results of the study of the draft of wagons (E. S. R., 51, p. 787) showed that high wheels reduced the draft on all the roadways tested, the amounts ranging from 9 per cent on good hard-surfaced roads to 36 per cent on roads with chuck holes and on roads with a firm base but with loose material on top. Wide tires reduced the draft on all the roadways tested except those with a firm base but with loose material on top. The greatest reduction was 20 per cent on corn stubble.

Data on the cost of electricity from three 32-volt farm light plants are also included (E. S. R., 51, p. 787).

[Agricultural engineering studies at the Wisconsin Station] (*Wisconsin Sta. Bul. 373 (1925), pp. 51–55, figs. 3*).—Data from tests of silage cutters noted on page 486 are briefly reported.

Data on rock blasting indicate that the mud cap method has been found entirely satisfactory as a means of breaking ordinary rocks and bowlders. Experiments have shown that when holes are drilled into rock, with labor at ordinary prices, the total cost of the process is considerably higher than that with the mud capping process.

Black soil under irrigation with bore water, R. W. McDiarmid (*Agr. Gaz. N. S. Wales, 35 (1924), No. 12, pp. 845–854, figs. 3*).—Data on the use of artesian bore water for irrigation purposes in New South Wales are presented. The results showed that irrigation with artesian water is highly successful, and, apart from the production of crops for marketing, the carrying capacity of the land can be very much increased thereby, with special reference to grazing.

Cache County water conservation district No. 1, W. Peterson, G. D. Clyde, D. S. Jennings, M. D. Thomas, and K. Harris (*Utah Sta. Bul. 193 (1925), pp. 1–44, figs. 12*).—A description of this district and its agricultural features is presented.

Public Roads [May, June] (*U. S. Dept. Agr., Public Roads, 6 (1925), Nos. 3, pp. 45–68+[1], figs. 16; 4, pp. 69–92+[1], figs. 22*).—These numbers of this periodical contain the status of Federal-aid highway construction as of April 30 and May 31, 1925, respectively, together with the articles following:

No. 3.—The Maine Highway Transportation Survey, by J. G. McKay and O. M. Elvehjem; and The Wagon and the Elevating Grader.—Part II, The Influence of Design on Elevating Grader Costs, by J. L. Harrison.

No. 4.—The Publication of Research, by E. W. Allen; The Wagon and the Elevating Grader.—Part III, Estimating the Cost of Elevating Grader Work, by J. L. Harrison; Condition of the Ohio Post Road after 10 Years under Traffic, by F. H. Jackson; A Stability Test for Bituminous Mixtures, by W. J. Emmons and B. A. Anderton; and Effect of Grading on Sand Strength Ratios, by C. E. Proudley.

Nail-holding power of cinder concrete (*Concrete [Detroit], 26 (1925), No. 4, p. 144*).—Tabular data on the holding power of wire nails in cinder concrete building blocks as compared with wood are briefly reported.

Tapered struts: A theoretical and experimental investigation, J. E. Boyd (*Ohio State Univ. Engin. Expt. Sta. Bul. 25 (1923), pp. 91, figs. 23*).—The results of a theoretical and experimental investigation of tapered struts to develop exact formulas for the computation of the strength and deflection of such tapered compression members is presented in considerable detail.

Investigation is made of low pressure tires, T. R. Agg (*Iowa Engineer, 25 (1925), No. 5, p. 8, fig. 1*).—Studies conducted at Iowa State College on fuel consumption and its relation to the resistance of balloon tires showed that in general the rolling resistance of low pressure tires is about 8 lbs. per ton higher than for the regular high pressure tires, or at a speed of 30 miles per hour, is about 20 per cent higher. The increase in gasoline consumption was not in proportion to the increase in rolling resistance. On the average the balloon tire and the balloon type of tire gave about the same results, and both showed an increase in fuel consumption of about 7 per cent over the regular high pressure tires. General observations during about 6,000 miles of operation indicated that the low pressure tires will give satisfactory wear if the vehicle is not driven with the wheels in bad ruts.

The physical characteristics of road and of field dust, C. E. Summers (*Jour. Soc. Automotive Engin., 16 (1925), No. 2, pp. 243–247, figs. 8*).—The results of a 2-year study on the chemical composition, particle size, specific

gravity, and abrasive nature of road dust and the relative amounts of it to which an engine may be exposed under varied conditions are briefly reported.

Chemical analyses showed that samples of road and field dust taken from different States vary considerably in composition, from 90 to 98 per cent by weight being mineral matter. Road dust particles of different chemical composition do not differ materially in abrasive character, however. The specific gravity of dust particles varies somewhat, but is about 2.5, which corresponds very closely to that of quartz. Dust, therefore, is not in itself a light substance, and its ability to float in the air for a length of time is a function of its size rather than of its specific gravity.

In this connection it was found that a size of particle is finally reached at which its weight is not sufficient to move it at any considerable velocity against the friction and viscosity of the air. Thus, when a large number of particles of varied sizes are thrown into the air by any violent agitation, the larger ones fall rapidly and remain suspended only a few seconds. The smaller the particles are the longer they will remain suspended, until the very finest fall so slowly that the eddy currents of the wind tend to carry them upward. So far as could be observed no dust exists which is harmless from the abrasive standpoint, although the very fine particles were found to be somewhat less abrasive than an equal weight of coarse material.

Studies of engine wear showed that where dust is present more wear exists at the top than at the middle or the bottom of the cylinder, due probably to the fact that the surface at that point is exposed to dust lodgment during a greater period of time and that the lubricating film is thinner.

Methods of testing air cleaners are described.

Removal of floating dust in grain elevators (*Chicago: National Safety Council, 1924, pp. 32, figs. 12*).—Studies to determine the essential factors involved in the application of suction to belt loaders, belt discharge pulleys, elevator boots and heads, garners, and similar items of grain handling equipment, so as to minimize the escape of floating dust into the atmosphere of the plant without picking up an appreciable percentage of solid grain, are reported.

It was found that the average velocity of air entering a dust collecting hood must not be greater than 500 ft. per minute in order that solid grain may not be picked up. A velocity of 500 ft. per minute will control the floating dust. The results of the boot, head, garner, and belt tests showed that for a velocity much in excess of 500 ft. per minute, small quantities of solid grain were found in the traps. Lowering the boot connection velocity from 732 to 630 ft. per minute greatly reduced the solid grain picked up. Lowering the head connection velocity from 587 to 468 ft. per minute had a similar effect. The belt hood tests showed a good control of the floating dust with an intake velocity of 537 ft. per minute. The floating dust was effectively controlled in all tests.

It was further found that the average velocity of air in pipe lines must be at least 4,000 ft. per minute in order to prevent clogging of the lines due to the settling out of any materials likely to enter the system. This is considered to be especially important in view of the frequent and usual connection of floor sweeps and dust hoods to the same trunk line piping.

A definite relation was found to exist between hood intake velocity and pipe line velocity, and in the usual type of installation this is a matter of ratio of hood intake area to pipe area. Any pipe line velocity in excess of 4,000 ft. per minute may be employed, provided the hood area is large enough to limit the intake velocity to 500 ft. per minute.

Inspection traps may be readily constructed and installed in the branch pipe lines in convenient places so as to prove at any time whether or not solid grain is being carried through the line.

As compared with direct suction connections, indirect connections are not effective in removing or controlling floating dusts. Tests made on two typical indirect garner connections showed that not only was the speed of air flow through the hood extremely small, but that floating dust escaped around spouts and through other openings in the garner top.

Descriptions of the theory and apparatus involved in these studies are appended.

Final report on the 1924 California air-cleaner tests, A. H. Hoffman (*Jour. Soc. Automotive Engin., 16 (1925), No. 3, pp. 367–371, 378, figs. 5*).—Continuing previous work (E. S. R., 49, p. 688), this report presents the results of the studies from June, 1924, to the end of the year at the California Experiment Station, and includes data from tests of 12 new makes or models of air cleaner not previously tested or not fully tested.

A discovery of outstanding importance was that the quantity of dust inspired by any cleaner or carburetor is greatly reduced if the intake is placed high and faces away from the direction of motion of the vehicle. The cleaners on two 3.5-ton trucks, with intakes located 46 and 48 in. above ground and facing forward, encountered approximately 0.07 and 0.08 gm. of dust per mile, respectively, whereas two other trucks of the same make and model and used in the same work, which had no air cleaners but whose intakes were directed backward, encountered much less dust.

Air-cleaners on trucks in service, A. H. Hoffman (*Jour. Soc. Automotive Engin., 16 (1925), No. 2, pp. 249–256, figs. 7*).—Tests conducted by the California Experiment Station of the action of air cleaners on eight 3.5-ton trucks are reported and discussed.

The results indicated that in a service test involving several uncontrollable variables, no just comparisons can be drawn among air cleaners not differing greatly in efficiency. Frequent changing of crankcase oil and consequent maintenance of higher viscosity was found to markedly reduce engine wear. Placing the air inlet high up and well back under the hood lessened the quantity of dust encountered. It was found that the air inlet should face forward, since a rearward opening acted as an inertia-type dust separator.

Foreign material in used oil: Its character and effect on engine design, G. A. Round (*Jour. Soc. Automotive Engin., 16 (1925), No. 2, pp. 232–236, figs. 11*).—Studies of samples of used engine oil under the microscope are reported, showing that the carbonaceous material is extremely finely divided and that the particles are held together loosely by oxidized oil. Dust particles in the oil can be distinguished from other foreign material by means of photographs taken by polarized light. An examination of a number of samples showed that the dust particles circulating with the oil are small in comparison with those drawn in through the carburetor intake, indicating that they have been pulverized on the cylinder walls.

Further tests showed that air cleaners are of direct benefit, but that the use of other devices to prevent dilution and to keep the oil free from foreign material is equally desirable. Oil screens can not be expected to remove any but the coarest material, such as lint. They should therefore be of fairly coarse mesh and of liberal area in order to provide a free flow of oil at low temperatures, and should also be self-cleaning.

Cost of rural electrification, M. L. Cooke (*Elect. World, 85 (1925), No. 15, pp. 765, 766, figs. 3*).—Data from the Giant Power Survey in Pennsylvania are briefly presented and discussed.

It is stated that estimates have been obtained for a mile of rural distribution line of from $800 up. It is assumed that $1,200 per mile is a good average where construction is carried on on a large scale. With this in view, the data presented indicate that to reach 750,000 additional population in rural and semirural areas, of which 325,000 would be straight farm population, the cost would be roughly from $25,000,000 to $30,000,000. Such a program extended over, say, 10 years, would mean an annual expenditure of about 3 per cent of the present annual capital expenditures in Pennsylvania.

Rural electrification in Pennsylvania, R. U. Blasingame (*Elect. World, 85 (1925), No. 14, pp. 713–715, figs. 5*).—A brief statement of the results of field surveys as to the agricultural uses of electricity in the State is presented, together with an analysis of some of the problems involved. It is concluded that before rural electrification can be instituted successfully much research work must be done on such elements as the determination of a satisfactory rate, the improvement of existing farm machinery, the determination of the best ratings and sizes of farm machinery, and ascertaining the proper farming methods for insuring the most uniform use of labor and machinery.

Electrification of rural districts in France (*Elect. World, 85 (1925), No. 12, pp. 605, 606*).—A brief account is given of the electric service in the towns and more important rural localities of the Department of Loire-Inférieure in France.

Electric power for orchard spraying, B. D. Moses and W. P. Duruz (*Jour. Elect., 54 (1925), No. 4, pp. 129–131, figs. 6*).—In a contribution from the California Experiment Station data on the use of electric power for the spraying of orchards are briefly presented. It is estimated that in the early spring when spraying is most essential at least 75 per cent of the spray rigs in California are in operation. This means a possible load of approximately 22,500 h. p. which, spread throughout the year, would total about 10,000,000 h. p. hours.

Electric washing machines, R. M. Kellogg (*N. Y. Agr. Col. (Cornell) Ext. Bul. 102 (1924), pp. 11, figs. 4*).—Brief popular information is given on electric washing machines.

Efficiently filling the silo, F. W. Duffee (*Agr. Engin., 6 (1925), No. 1, pp. 4–12, figs. 12*).—A continuation of the silo filler tests at the Wisconsin Experiment Station is reported (E. S. R., 50, p. 687).

The results of tests of the maximum capacity of silage cutters indicated that a formula can be established for capacity which will be reasonably accurate. It was also found that these machines have much greater capacity than is ordinarily considered, and that 15 or 16-in. flywheel machines and 18 or 20-in. cylinder machines have much more capacity than any ordinary crew of men can supply. This is taken to indicate that larger machines are unnecessary, and that machines of these sizes can be operated at speeds approximately 40 per cent slower than at present recommended and still have sufficient capacity for ordinary requirements.

The O. A. C. diagonal axle dusting machine for treating wheat for smut, G. W. Kable (*Oreg. Agr. Col. Ext. Bul. 381 (1925), pp. 7, figs. 5*).—This machine is described and illustrated.

The insulation of roofs to prevent heat loss and condensation, W. L. Miller (*Heating and Ventilating Mag., 21 (1924), No. 11, pp. 45–49, 61, fig. 1*).—Continuing work previously noted (E. S. R., 53, p. 287), data on the insulation of roofs are presented, with notes showing how to figure this work and information on the savings made possible when effective insulation of roofs is applied.

Colorado farm flock poultry house, O. C. KRUM and O. C. UFFORD (*Colo. Agr. Col. Ext. [Bul.] 224A (1924), pp. 8, figs. 7*).—Brief popular information and working drawings for the Colorado farm flock poultry house is presented.

Farm water works and sewage systems, T. B. CHAMBERS and M. L. NICHOLS (*Ala. Polytech. Inst. Ext. Circ. 80 (1925), pp. 35, figs. 22*).—Practical information on the planning of water supply and sewage disposal systems for farms, with special reference to the requirements of Alabama conditions, is presented in this circular.

A study of the effects of anions upon the properties of "alum floc," L. B. MILLER (*Pub. Health Rpts. [U. S.], 40 (1925), No. 8, pp. 351–367, pl. 1, figs. 7*).—Studies are reported in which the importance of the negative ion content of the solution in relation to some of the chemical and physical properties of alum floc is established, and its bearing upon water purification by the alum process is discussed. Emphasis is placed upon the dependence of the physical state of the insoluble aluminum compounds formed upon the anions present.

The lack of agreement of other workers upon the region of H-ion concentration in which coagulation of alum takes place is explained as partially due to the negative ion content of the solutions in question and to the presence of colloidal material such as silicic acid or organic matter. For aluminum sulfate it is demonstrated that the so-called hydrion zone of rapid coagulation tends to shift toward the more acid portion of the so-called hydrion zone of coagulation. A few possible applications of the principles discussed are pointed out, and the coordinate importance of the aluminum ion and of the sulfate ion for current waterworks practice is emphasized.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics and sociology at Wisconsin Station, 1923–24] (*Wisconsin Sta. Bul. 373 (1925), pp. 55–62, figs. 4*).—Continuing studies of the service relations of town and country, earlier ones of which have been noted (E. S. R., 50, p. 691), the high school, hospital, library, and recreation facilities of 8 small towns selected as representative of various agricultural conditions in Wisconsin were studied by J. H. Kolb. It was indicated that the kind of institutions in the town and their service policies affect very directly the standards of living on the farm. At the present time 72 per cent of the area of Wisconsin lies outside of any legal high school district. It was found that 42.6 per cent of the patients in the hospitals were from farm homes. From the study of the libraries it was indicated that farmers make less use of this service institution than of the others.

About 100 large scale cooperative marketing organizations in the United States and 8 companies in Denmark had been studied throughout the year by T. Macklin and G. F. Johnson, and the conclusion was reached that contracts between farmers and their own company are helpful and desirable.

Data gathered during the silo filling seasons of 1921 to 1923, inclusive, on 282 farms were analyzed, showing the costs to have varied from $1.02 to $4.65 per ton, the average being $2.07. Man labor amounted to 28 per cent of the total cost, horse labor 16, equipment 33, and silo costs 23 per cent.

In a study by L. C. Thomsen of creamery operating costs replies to questionnaires were received from 47 creameries in 23 Wisconsin counties. A summary of these replies is tabulated. The creameries which produced 600,000 lbs. of butter a year were found to be paying their patrons a better price per pound than the smaller plants.

Monthly Supplement to Crops and Markets, [June, 1925] (*U. S. Dept. Agr., Crops and Markets, 2 (1925), Sup. 6, pp. 169–200, figs. 2*).—As features of this issue, returns of a survey of returns on 15,103 farms for 1924 are tabulated and discussed, as are also reports from 7,153 farmers in representative sections of the United States as to the cost of producing field crops in 1924.

An average return to the owner operator of $1,205 for the use of capital amounting to $17,260 and the labor of the farmer and his family is the average for 1924 as determined by this study. This is a higher return than that for 1922 or 1923, both receipts and expenses having been greater but with a greater margin between them. The average cost per bushel of producing the 1924 corn crops on the farms reported upon was 82 cts., whereas it was 68 cts. on 11,238 farms in 1923, and 66 cts. on 3,363 farms in 1922. The average cost per bushel of producing wheat on 4,016 farms in 1924 was $1.22 as compared with $1.24 on 7,852 farms in 1923 and $1.23 on 2,417 farms in 1922. Oats cost an average of 50, 52, and 53 cts. per bushel, respectively, on 5,509 farms in 1924, 8,481 farms in 1923, and 2,601 farms in 1922. No great differences were found in either the acre or bushel costs of producing potatoes in 1923 and 1924.

The usual tabulations showing the condition of crops, the estimated prices of farm products received by producers with comparisons, and the reports for the month with reference to the livestock and meat situation, the receipts and disposition of livestock at public stockyards, shipments of fruit and vegetables, cold storage holdings, and miscellaneous items are given. A report setting forth sale prices of purebred hogs and sheep for 1923–24 and a review of the current price situation are included.

Organization and management of typical West Virginia farms, A. J. Dadisman (*West Virginia Sta. Circ. 38 (1925), pp. 4*).—This circular summarizes the more important results previously noted (E. S. R., 52, p. 589).

The Metropolis Reclamation Project, J. C. Lambert (*Nevada Sta. Bul. 107 (1924), pp. 30, figs. 6*).—This bulletin presents the results of a detailed survey of a typical small reclamation project in Elko County, Nev., which was reclaimed in 1911 and developed by a private company until during 1913 and 1914 the population reached almost 1,000, but which, owing to the fact that the water supply was insufficient, practically failed until in 1924 only 33 families remained. The survey of the farm, home, and social conditions prevailing in 1923 was made by the author in the spring of 1924.

Thirty-one of the families living on the project were included in this survey. All of the farmers own land, and some operate additional land owned by the company. The average total acreage farmed is 173 acres. Potatoes constitute the chief cash crop, while dairying is the chief source of income. The receipts from crops average $461 and from sales of livestock $368 per farm. The receipts from livestock products, principally cream, amount to $703. The labor income averages $753 per farm. The value of home-grown foods used by the family is $441, and the cash paid out for groceries $311 per family.

Some economic aspects of farm ownership, C. L. Stewart (*U. S. Dept. Agr. Bul. 1322 (1925), pp. 24, figs. 5*).—A study of trends and variations in some of the financial burdens and benefits of farm ownership in the spring wheat belt over 25 years is presented here. The records of the 16 farms in Cass County, N. Dak., that are used in illustration cover an average of 27 years and are held to be almost perfectly consistent. These farms are located in the community controlled largely by the Amenia-Sharon Land Company (E. S. R., 51, p. 890).

Although the selected farms had a smaller investment in buildings per acre relative to the land valuation, the investment per farm was larger than that of the average farm of the State and Nation. General trends in the factors

that affected the economic position of the owners of these farms between 1896 and 1920 are treated in considerable detail, and the short-swing movements above and below these trends are also pointed out.

Over the 25-year period farm real estate valuations per acre showed an upward movement at the rate of 8.4 per cent yearly. The corresponding rate for the prices of all commodities was 6.2 per cent, for unconverted primary net rents 6.7, for real estate taxes 5.6, and for five cost items 2.8 per cent. It appears that the economic position of the owners of these farms was improved, in spite of the decreasing average yields per acre, as a result of the increased value of the physical units produced and the cheapening of marketing service, particularly transportation, as measured in terms of commodities. Rents and increments yielded an average annual rate of return on current real estate valuations of over 9 per cent. When allowance was made for variations in the general wholesale prices, these accruals were at an average rate of about 6 per cent. Primary net rent per $100 worth of real estate was for the year 1896 $5.40 and for 1920 $2.26. The net increment likewise was for 1896 $4.93 and for 1920 $7.83. The interest rate on first mortgage security was in 1896 $9.30 and in 1920 $6.80 per $100 borrowed.

Cost of producing field crops, 1923, M. R. Cooper and C. R. Hawley (*U. S. Dept. Agr., Dept. Circ. 340 (1925), pp. 28*).—This report presents the findings of the cost of production of certain crops obtained from the replies to a cost of production questionnaire sent to crop and livestock reporters located in all of the States. Corn, wheat, and oats were studied in 1922 and 1923, and potatoes and cotton were included in the study for 1923, which has been noted from another source (E. S. R., 51, p. 692).

Successful threshing ring management, E. Rauchenstein and C. A. Bonnen (*Illinois Sta. Bul. 267 (1925), pp. 373–403, figs. 2*).—Complete cost accounting records were kept on from 15 to 20 farms in Hancock and Franklin Counties from 1913 to 1922, inclusive, and on from 10 to 14 in Champaign and Piatt Counties from 1920 to 1922, inclusive. These records show the variations in different years and on different farms in the amounts of labor used for threshing. In a farm-to-farm survey in Douglas, Champaign, and Ford Counties during the summer of 1921, 74 threshing rings were visited and 142 farmers interviewed as to the organization and management of the rings and the cost of threshing, both per 100 bu. of grain and per acre. Furthermore, detailed records were secured from 14 threshing rings, including 166 farms in Champaign and Ford Counties, and were used to show the labor requirements for threshing.

In central Illinois, approximately 11 hours of man labor were required to thresh 100 bu. of oats and 20 hours to thresh 100 bu. of wheat. In Franklin County, approximately 18 and 25 hours, respectively, were required. It is held that under favorable weather conditions and with efficient management 100 bu. of oats can be threshed with 6 hours of man labor and 10⅔ hours of horse labor.

Labor settlements in threshing rings are made on the hour, bushel, or acre basis.

A sample agreement for the cooperative ownership of threshing machines is presented. It is thought that the rate for such outfits can best be determined after the threshing season. It should be high enough to cover cash disbursements and a fair rate of depreciation and interest, the allowance for the latter being credited to each cooperator in proportion to his investment.

Economic aspects of creamery organization, J. D. Black and E. S. Guthrie (*Minnesota Sta. Tech. Bul. 26 (1924), pp. 3–111, figs. 25*).—Problems of economic as distinguished from financial and business organization are dealt

with here. The data reported upon were obtained partly from official sources but largely from a survey of 102 Minnesota creameries, records from 88 of which are used in most of the tables. The work was in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Causes for variations in prices paid for butterfat, due principally to differences in prices received for butter, the cost of manufacture and preparation for market, and overrun, are presented. Creamery costs are classified as elementary and as process costs. Elementary costs include site, buildings, equipment, labor, management, supplies, and miscellaneous, while the second classification divides these costs on the basis of the processes of receiving, Babcock testing, preparation for the churn, churning, preparation for market, record keeping, and correspondence. Hauling, side lines, and extra space are classed as separate costs. Besides these certain intermediate costs are also identified.

Among other important factors illustrated, five curves have been drawn which show the variations, with output of each, of the four elementary costs, equipment, space, labor and management, and supplies, and of the four costs combined. Labor and management appears to be responsible for much more of the decrease with output than any other factor. Supplies and miscellaneous is next in significance. Space and equipment produce the most pronounced effect close to the bottom of the scale of output in 1,000 lbs., while the combined effect is a curve of decreasing cost all the way up but at a decreasing rate from the very bottom and especially after 200,000 lbs.

The average proportion between the four elementary costs is building and site 11.7 per cent, equipment 9.9, labor and management 32.5, and supplies and miscellaneous 45.5 per cent. Individual creameries were found to vary greatly, however, from these standards. The ordinary range in creamery costs per pound of butter was 6 cts., the ordinary range in price received 10 cts. It is concluded that higher creamery costs, when allowance is made for output and quality of cream, have in general no very appreciable effect on the quality of the product, being, therefore, due to other causes than an effort to secure a better product. Each creamery is advised to determine the grade of butter maker it can best afford, always making allowance for what a good operator can do in getting the farmers to improve their cream. If sufficient volume can be obtained, a high-salaried butter maker can be hired even for poor cream.

The average territory of the 88 creameries covered in this survey was 96 square miles. It is to be noted that density of butterfat production does not alone determine the creamery area and size. On the whole, the creameries are larger in the dense than in the thin territory, but not as much so as might be expected. Of the 692 creameries in the State in 1920 all but 167 were located at a shipping point. Only 12 of the 88 visited in this survey were in the country.

Address on taxation of farm lands, R. T. Ely (*Tri-State [Minn.-Wis.-Mich.] Devlpmt. Cong. Rpt., 4 (1924), pp. 55–80, figs. 6*).—Attention is directed to farm real estate values and the rapidity with which taxes are overtaking land values, as well as to the percentage of net rent before taxes are paid which must be used in paying property taxes. Data from a number of farm surveys and from the census are cited. It is stated that it remains for the Nation to work out in detail a system of taxation in which direct and indirect taxes will find their proper place. The author declares himself in favor of income and property taxes payable in installments.

The costs of marketing the apple crop of 1923, L. P. Jefferson (*Massachusetts Sta. Bul. 224 (1925), pp. 9*).—Information obtained by personal visits to growers in Franklin County, the Granville area in Berkshire County, the

Newbury section in the northeastern corner of the State, and an area including scattered growers of Middlesex and Worcester Counties, Mass., is presented here. The costs of marketing are considered as beginning with the cost of picking and including all actual expenditures until the fruit is in the hands of the first purchaser, whether he be buyer, wholesaler, retailer, or consumer. Sales of grade A apples on commission brought the highest price for this grade, and sales on commission averaged the highest prices and the highest margins. All graded apples, including the so-called ungraded remaining after other grades are removed, brought an average price of $1.79 per bushel, with an average margin of $1.03. The true ungraded apples brought an average price of $1.03, with a margin over costs of marketing of 57 cts. a bushel, practically half the margin on all graded apples. Omitting the inferior grade, the graded apples brought an average price of $1.88, with an average margin of $1.08 per bushel.

The conclusions reached from this study are that sale to country buyers is the least profitable method of sale, that it pays the grower to grade his apples, and, as noted above, that sales on commission give the highest returns.

Retail marketing of meats, H. C. MARSHALL (*U. S. Dept. Agr. Bul. 1317 (1925), pp. 86, figs. 6*).—A complete personal canvass was made from January to August, 1920, of the retail meat trade of 33 urban districts and of rural districts in 8 counties throughout the United States deemed representative of various types of farming and rural life. Information was obtained from dealers regarding their experience, previous occupation, nationality, and the general character of their business as to permanency, type of store, class of business, volume of sales, grade of meats sold, advertising and accounting methods, sanitary conditions, character of the locality, and certain other items serving to give a general picture of the trade in these representative districts and thereby of the entire country. An examination was made of all available accounting records covering the year 1919 of concerns whose trade was exclusively or almost exclusively in meats and of a limited number of concerns with a combination of fresh meat and grocery trade to obtain data regarding operating expenses, the gross margin between cost of merchandise at wholesale and sales at retail, and the net profits of the dealer. In the rural districts information was obtained regarding such distributing agencies as meat wagon routes, meat peddlers, and beef clubs, and this canvass was supplemented by requesting information by mail from 1,683 county agricultural agents throughout the country. Other information, particularly with reference to chain-store systems and branches, was obtained. The returns are discussed, tabulated, and graphically presented.

Crops and Markets, [June, 1925] (*U. S. Dept. Agr., Crops and Markets, 3 (1925), Nos. 23, pp. 353–368; 24, pp. 369–384; 25, pp. 385–400; 26, pp. 401–416*).—In these numbers are to be found the usual current weekly summaries of market information as regards agricultural commodities and tabulated summaries comparing receipts, shipments, prices, and other market information over longer periods and with comparisons.

Relation between value and volume of agricultural exports from the United States, H. M. STRONG (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 271 (1924), pp. II+77, figs. 28*).—This bulletin discusses the changes in our export trade in agricultural products, first in actual value as stated in the export trade statistics and second after allowance has been made for the increase in prices. The figure used in the second instance is determined by finding, by a method described below, what the value of the quantity exported in each year of the war and post-war years would have been had the price remained the same as before the war. It is brought out that there has

been a marked expansion in the volume of our foreign trade in some agricultural products, while in other commodities, notably cotton, the actual volume exported is very much smaller than formerly, particularly before the war. Three methods of computing export volume are suggested, the second of which depends upon the use of a price index number and the third a figure for a constant price. Wholesale and other price indexes available are criticized and found to be unsatisfactory for use either with the values of agricultural exports as a whole or for use with individual groups of products. The first method suggested was deemed wholly inaccurate for the purpose here.

A careful study was made of 98 agricultural export items for which quantities are given. The 5-year average value of each commodity was divided by the 5-year average quantity exported to secure an average unit price. The quantity of the items exported in each year after 1913–14 was then multiplied by this pre-war average price in order to determine what the export value of the commodity would have been if prices had not fluctuated but had remained at the average pre-war level. The total of these values at pre-war prices for each year is held to represent the relative volume of agricultural exports weighted according to their value. The 98 items taken into consideration represent 97 per cent of the total value of all agricultural exports, and the totals obtained by the method described are prorated up to 100 per cent, assuming that the quantities of the 3 per cent of agricultural exports for which value only was given fluctuated in the same manner as the other 97 per cent.

A comparison is made of export value and the value estimated on pre-war prices, which shows that from 1915 to 1917 the volume declined rapidly until it had almost reached the pre-war level. A slight increase is noted in 1918, and the highest volume or value estimated at pre-war prices occurred in 1919. The next year reported a loss, while 1921 showed a slight increase, which was followed by decreases in 1922 and 1923, the figure for the last year being only 5 per cent more than the pre-war average value of these exports. A measure is taken also of fluctuations in price, using the 1910–1914 average as a base. Pages 15–46 present a discussion of the value, volume, and rank of the chief commodities and commodity groups of agricultural exports. Eight tables are given in pages 47–77.

International competition in the production of wheat for export (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 210 (1924), pp. II+25*).—This is a survey of the international wheat situation, with an outline of certain significant changes that have taken place in world wheat movements since the war. The relation of these changes to our own production and our future export trade in wheat is pointed out. No immediate marked increase in Europe's demand for wheat is held likely. The situation in the principal producing countries is briefly reviewed, future expansion in Canada and Russia being regarded as the most important. Each individual is urged to give careful consideration to his own problems of adjustment. It is suggested that the most favorable situation for our wheat growers would be such reduction and disposition of the acreage as would furnish the high-grade wheat needed for domestic consumption and meet the export demand for Pacific soft wheat, durum wheat, and flour, thus eliminating our semihard and semisoft wheat from the export trade.

The price balance between agriculture and industry, C. J. Brand (*Acad. Polit. Sci. New York, Proc., 11 (1925), No. 2, pp. 9–35, figs. 4*).—Agricultural prices in recent years are reviewed mainly from the standpoint of the purchasing power of farm products. Other topics discussed are the American farmer's competitors in the world market; the relation of the tariff to the

agricultural problem, with special reference to wheat; wages and farm prices; and the price of farm machinery in terms of the purchasing power of hogs.

It is held that a better price balance is to be secured through the adjustment of production to demand, establishment of a suitable device to deal with the problem of the export surplus, increase in the general price level, reduction of direct taxes, reduction of freight rates, increased efficiency in production, increased economy in distribution, further extension of cooperative marketing, repression of agricultural exploitation, increase of domestic demand, increase of foreign market outlets, and extension of the practice of diversification.

Legislative interference with agricultural prices, B. H. HIBBARD (*Acad. Polit. Sci. New York, Proc., 11 (1925), No. 2, pp. 36–49*).—The author reviews the history of Government aid to railroads, manufactures, labor, and the banks. Three types of legislation which have been suggested for the aid of the farmers are briefly noted as characterized, respectively, by price fixing, Government purchase of surplus with its permanent removal from the market, and Government assistance in the pooling of agricultural products. A detailed discussion is given of the McNary-Haugen bill. It is criticized from the point of view that there is no probability that either the list of commodities named or the price ratio first agreed upon would remain fixed and satisfactory. The objection to the plan is the objection to price fixing.

Cooperative marketing and agricultural prices, C. H. TUCK (*Acad. Polit. Sci. New York, Proc., 11 (1925), No. 2, pp. 50–57*).—The Dairymen's League Cooperative Association is discussed here as an example of cooperation based upon principles contributing to fair prices and progress in the field of marketing milk and milk products.

The farmer's view of agricultural prices: Regulation by statute or by economic laws? W. W. GAIL (*Acad. Polit. Sci. New York, Proc., 11 (1925), No. 2, pp. 58–69*).—The agriculture of Montana is described under the heads of stock farming, irrigation farming, and dry farming. The era of farm acquisition from the year 1905 to 1918, inclusive, was a boom period. It was followed by a serious slump, but a reaction has taken place in the more recent years and practical action for improvement has been taken.

[Discussion of agricultural prices] (*Acad. Polit. Sci. New York, Proc., 11 (1925), No. 2, pp. 3–8, 70–78*).—Discussion of the four papers noted above, which, together with introductory remarks by W. L. Ransom, chairman of the session, on human factors in farm prices (pp. 3–8), constitute the section on agricultural prices of the annual meeting of the Academy of Political Science in New York, November 14, 1924, was presented under the titles The Agricultural Depression and the Price Level (pp. 70–72), by G. F. Warren, and Does the Farmer Need Help? (pp. 73–78), by L. D. H. Weld.

Long-time agricultural programs in the United States—national, regional, and State, compiled by M. G. LACY (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 5 (1925), pp. 20*).—Letters from State and agricultural college officials and supplementary information from other sources constitute the basis for this bibliography, issued in mimeographed form. A number of published discussions of national and regional programs are cited, and State programs are listed by States alphabetically.

[Investigations by the rural life department at Missouri Station], O. R. JOHNSON ET AL. (*Missouri Sta. Bul. 228 (1925), pp. 69–74*).—Preliminary reports are submitted on projects in economics and sociology carried on in 1923–24.

Movements of rural population in Missouri, E. L. Morgan.—A general study is being made in 11 counties and an intensive study in Boone County to deter-

mine and interpret in general and specifically where possible the effect of rural population movements upon the families migrating, the local rural community, and general and public welfare in the State. So far it has been found that 88 per cent of the farmers studied who have migrated from farms have profited financially by the change, while 12 per cent have lost money. Where migration has been marked, the community seems to have suffered as a result of the effect this migration had on the activities of the school, the church, farm organizations, and social interest.

Distribution of farm labor, O. R. Johnson and B. H. Frame.—The percentage distribution of man labor and of horse labor is tabulated by operations and for the months of the year for the years 1912 to 1922, inclusive.

An analysis of the Columbia trade area showing the influence of various economic factors on the shape and size of this trade area, O. R. Johnson.—More newspaper and hardware accounts and fewer grocery accounts per mile were found on gravel than on dirt rural route roads. The territory within 3 miles of town showed a marked increase in the number of newspaper, hardware, and grocery accounts per mile of road over that part of the territory lying farther away from the town. There seemed to be a slight tendency for the number of newspaper and hardware accounts per section to decrease from the poorest to the productive soil regions. The number of hardware accounts increased as the newspaper accounts.

A study of the rural primary groups of Boone County, Missouri, E. L. Morgan.—Fifty-nine primary population groups and 15 secondary ones were found in this county, and, all having been rated as to the intensity of their group consciousness, 7 were found to be high, 10 medium plus, 25 medium, 10 low, and 7 low minus. The self-consciousness of primary population groups varied directly with the distance from a larger community center, and the intensity of it was greatest where the most activities centered.

Beef cattle production in Missouri, E. A. Trowbridge, O. R. Johnson, and B. H. Frame.—This project is being carried on by the station in cooperation with the Bureau of Agricultural Economics, U. S. D. A. Extracts from preliminary reports, issued in March, 1924, by the bureau, are given, and financial results of feeding operations for the years 1919 to 1923, inclusive, are tabulated.

Economic and social study of Tennessee, C. E. Allred (*Tenn. Univ. Rec., Ext. Ser., 1 (1924), No. 5, pp. 64, figs. 2*).—Some 70 tables giving by counties of the State data derived from Federal or State official statistics have been prepared with the aim of furnishing the basis for a State program of economic and social improvement. Tennessee is compared with each of the other States, and a comparison is made of the counties of Tennessee.

Annual statistical report on agricultural and pastoral production, 1923–24 (*New Zeal. Statis. Rpt. Agr. and Past. Prod., 1923–24, pp. XVI+54*).—Final statistics from the annual census of the agricultural and pastoral industry in New Zealand are published here.

Supplement to annual statistical report on agricultural and pastoral production, 1923–24, M. Fraser (*New Zeal. Statis. Rpt. Agr. and Past. Prod., 1923–24, Sup., pp. IV+8*).—This supplements the report noted above.

AGRICULTURAL EDUCATION

Land-grant college education, 1910–1920, II–IV, edited by W. C. John (*U. S. Bur. Ed. Buls. 37 (1924), pp. V+108, pls. 4, figs. 3; 4 (1925), pp. V+108, pls. 8; 5 (1925), pp. V+75, pls. 7*).—These and a previously noted part of this study (S. S. R., 52, p. 898) are discussed editorially on page 501.

High school education of the farm population in selected States, E. E. WINDES (*U. S. Bur. Ed. Bul. 6 (1925), pp. 24*).—Questionnaire returns from North Dakota, South Carolina, Montana, Oregon, Maine, and New Hampshire, selected as representative of typical farming regions of the United States, furnish data for 1922 for all the States except South Carolina, in which case they are for the school year 1923-24. On the basis of this information it is attempted to show the comparative extent to which farm and nonfarm groups are receiving public secondary education and the relation of significant factors concerning high schools and the farm population to participation in secondary education by farm children.

It appears that farm children are not reached by secondary schools to the extent to which urban children are. Apparently the more purely agricultural a State, the greater is the discrepancy in the spread of secondary education to farm and nonfarm groups. There is a direct relation between comparative percentages of farm and nonfarm groups reached by high schools and comparative standards in the schools which serve the two groups. Farm boys are reached to a less extent than farm girls. Little relationship appears to exist between gross per capita farm income and high school attendance. A decided positive relationship exists between farm ownership and high school attendance. Apparently either the very small or very large farm makes against high school attendance.

Legal provisions for rural high schools, W. R. HOOD (*U. S. Bur. Ed. Bul. 40 (1924), pp. II+60*).—An analysis of the State laws is undertaken, and their provisions are examined in detail, giving particular attention to those covering the external organization and general administration of secondary education. Summaries of laws relating to the payment of tuition fees for high school pupils attending elsewhere than in their home districts are also presented.

Courses in rural education offered in universities, colleges, and normal schools, K. M. COOK (*U. S. Bur. Ed., Rural School Leaflet 37 (1925), pp. 18*).—Courses pertaining to rural education and planned especially for rural teachers, administrators, and supervisors are enumerated.

Analysis of the management of a corn-growing enterprise, C. H. SCHOPMEYER and A. P. WILLIAMS (*Fed. Bd. Vocat. Ed. Bul. 101 (1925), pp. VII+15*).—Analyses of the managerial-training content of farm jobs selected as managerial units are developed here to serve as samples of the results of analyzing jobs of this type. Determining the decisions to be made is said to be the first step in a managerial analysis, the next determining the factors influencing a result which must be considered in making each of the decisions.

A list of the publications of the U. S. Department of Agriculture relating to corn is given.

[Investigations in home economics at Missouri Station] (*Missouri Sta. Bul. 228 (1925), pp. 62, 63–65*).—Certain of the investigations in progress in 1923–24 were economic or psychological in character.

The psychology of child nutrition, C. R. Schmidt.—The general conclusions were reached with reference to the psychological principles involved when children refuse to eat that many of the problems of malnutrition have their foundation in earlier psychological problems of training in food habits. The early solution of psychological feeding problems should, therefore, establish better health conditions among children. Psychological feeding problems are deemed easy of solution if the parents recognize and handle them early enough, and the hope of the future in this matter lies in the wider education of mothers in the fundamental principles of child psychology.

Color knowledge essential to costume and its practical application, L. W. Gillum.—The effect of the color of the costume on the complexion, hair, and eyes of various types of people was noted, and the conclusions drawn with reference to the right choice of hue, value, and intensity for group types are presented.

Selection and economic use of soap in the home, L. Stanley and L. Sensintaffar.—Several brands of soaps and soap chips, flakes, and powders were examined chemically. Pure bar soaps were found to contain a high percentage of combined soda and of crude fatty acids, a low percentage of unsaponified matter, free alkali, and alkali as carbonate, silicate, and borate, and no insoluble material. These are considered to be more expensive than inferior soaps, even when the cost is reckoned on the basis of actual soap cost per ounce. Soap chips vary in purity as do bar soaps, and the cost is about the same as that of bar soaps of similar quality. The soap flakes tested were practically pure soap, and their cost was not greatly different from that of pure bar soaps. Washing compounds were found to have a very high percentage of alkali as carbonate, silicate, and borate, and they were considerably more expensive than bar soaps. Toilet soaps were purer than laundry soaps and were also more expensive.

A nutrition problem with special reference to negro children, B. K. Whipple and M. Baynham.—A study was made of white and negro preschool children and negro school children in elementary schools in St. Louis. A growing tendency toward the formation of good health habits by people of limited education was observed. All of the group of children of college women were above normal in weight. The lower the standards of living the lower the mental and physical conditions of the child were found to be, and the lower the educational status of the mothers the less emphasis seemed to be put upon right living. The negro children in the elementary schools showed a smaller percentage of malnutrition than the white children. However, the negro preschool children were not in as good physical condition as the white ones. Bad food habits were more noticeable in the negro than in the white children.

Sewing materials, M. B. Picken (*Scranton, Pa.: Woman's Inst. Dom. Arts and Sci., 1924, pp. VI+267+XVIII, figs. 133*).—This book is arranged as a reference for students and others, giving historical information and descriptions and uses of laces, textiles, embroideries, and findings, as well as suggestions as to buying, mending, and household sewing. An important list of sewing terms with definitions is included.

MISCELLANEOUS

Report of the [California] Agricultural Experiment Station, [1924], E. D. Merrill (*California Sta. Rpt. 1924, pp. 4+84*).—This contains the organization list, a report of the director and summary of the work of the station, including data as to projects and publications, and a summary, by B. H. Crocheron, of the work of the agricultural extension service (pp. 62–84). The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the director [of Connecticut State Station] for the year ending October 31, 1924, W. L. Slate, jr., et al. (*Connecticut State Sta. Bul. 264 (1925), pp. 193–219, figs. 6*).—The work of the station is briefly summarized by departments. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the Guam Agricultural Experiment Station, 1923, C. W. Edwards and J. Guerrero (*Guam Sta. Rpt. 1923, pp. 12, figs. 8*).—This contains

reports of the animal husbandman in charge, the assistant in agronomy and horticulture, and the extension division, and meteorological observations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of Moses Fell Annex, Bedford, Indiana, June, 1925, H. J. Reed and E. W. Moore (*Indiana Sta. Circ. 123 (1925), pp. 24, figs. 19*).—The experimental work summarized in this report is for the most part abstracted elsewhere in this issue.

Thirty-second Annual Report of [Minnesota Station, 1924, II] (*Minnesota Sta. Rpt. 1924, pt. 2, pp. 40, figs. 11*).—This part of the report presents a discussion of that part of the work under way in the divisions of animal husbandry, dairy husbandry, veterinary medicine, poultry husbandry, and bee culture. The experimental results reported are for the most part abstracted elsewhere in this issue.

New knowledge: One year's work [at the Missouri Station], July 1, 1923, to June 30, 1924, F. B. Mumford et al. (*Missouri Sta. Bul. 228 (1925), pp. 87, figs. 14*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1924. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of [Nevada Station], 1924, [S. B. Doten] (*Nevada Sta. Rpt. 1924, pp. 21, figs. 2*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, lists of station projects and publications, and a report of the director discussing the work and problems of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Progress of agricultural experiments: [Report of director of New Hampshire Station], 1924, [J. C. Kendall] (*New Hampshire Sta. Bul. 216 (1925), pp. 35*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1924. The experimental work reported is for the most part abstracted elsewhere in this issne.

New pages in farm progress: Annual report of the director, [Wisconsin Station], 1924, H. L. Russell, F. B. Morrison, and W. H. Ebling (*Wisconsin Sta. Bul. 373 (1925), pp. 99, figs. 40*).—This contains an acconnt of the activities of the station, a list of the station publications of the year, and a financial statement as to the Federal funds for the fiscal year ended June 30, 1924. The experimental featnres not previously reported are for the most part abstracted elsewhere in this issue.

NOTES

California University and Station.—Dr. H. J. Webber, professor of subtropical horticulture and director of the Citrus Substation, returned August 15 after a year's absence on sabbatical leave. During this time Doctor Webber served as a special commissioner of the departments of agriculture of the Union of South Africa and of Southern hRodesia, making a study of the methods of citrus culture used in these countries. In the prosecution of this work over 17,000 miles of the citrus-growing sections of South Africa were covered by railway and automobile. Considerable time was also given to a study of the organization and relationships of the various institutions giving attention to agricultural research, teaching, and extension, a confideutial report on this subject being prepared for the minister of agriculture of the Union Government. Doctor Webber also made short visits to various agricultural experiment stations and botanical gardens in England, France, India, Ceylon, the Federated Malay States, Java, Japan, and Hawaii.

Dr. C. M. Haring, professor of veterinary science and veterinarian, returned July 1 from a year of study and travel, which included eight months' work on diseases of cattle at the University of Zurich. Edwin C. Voorhies, assistant professor of animal husbandry, has returned from a year at the University of Copenhagen and the Royal Agricultural College of Denmark, during which economics and agricultural economics, particularly with reference to the cooperative movement, were studied. At the close of the academic year, three months were spent in travel and study in Norway, Sweden, Finland, and Holland.

Emil Rauchenstein was appointed associate in rural institutions August 1.

Delaware Station.—Dr. H. L. Dozier, chief of the division of entomology of the Porto Rico Insular Station, has been appointed entomologist, effective August 15. Other appointments include Dr. C. L. Benner as agricultural economist, effective September 1; L. E. Blackman, assistant chemist, effective July 1; and F. S. Lagassé, assistant horticulturist, effective September 1.

Iowa College and Station.—Dean and Director C. F. Curtiss has been named as the head of a special committee from the Corn Belt to work with State and Federal authorities in finding ways and means of fighting the European corn borer. The committee was selected at a conference in early October, composed of about 100 delegates from 12 States and Canada and following field trips in the borer-infested areas of Ohio, Michigan, and Ontario. Associated with Dean Curtiss on the committee are C. V. Truax and F. P. Willits, secretaries of agriculture for Ohio and Pennsylvania, respectively, Dr. C. G. Woodbury of the National Canners' Association, and Deans W. C. Coffey of Minnesota, L. E. Call of Kansas, H. W. Mumford of Illinois, and E. A. Burnett of Nebraska.

A. R. Lamb, chief of nutrition in the station, has accepted a commercial position in Illinois, effective September 1.

Kentucky University and Station.—Dean and Director T. P. Cooper has accepted the position of chief of the Bureau of Agricultural Economics, U. S.

Department of Agriculture, vice Dr. H. C. Taylor, and has entered upon his duties.

Louisiana University and Stations.—The university opened its fall term on the new campus, about 3 miles from the previous location. Approximately $4,000,000 has been spent in erecting new buildings, and the campus and farm lands occupy an area of approximately 2,000 acres.

The Sugar Station has been entirely transferred from Audubon Park, New Orleans, to new quarters on the university farm. Several cottages for laborers, feed and mule barns, tool sheds, etc., have been erected and roadways built wherever necessary. A series of very successful field day meetings for sugar planters was recently held at the farm, in order that the planters could see for themselves the kind of experiments that are being carried on in the new location. This work includes studies with cane varieties, insect and disease control, fertilizer tests, and seed selection. A general field day will also be held during the fall so that the sugar cane may be seen at maturity.

Dr. Herbert Spencer, entomologist at the Virginia Truck Station, has been appointed assistant entomologist beginning September 15, and will have for his major project a study of internal parasites of meat-producing livestock. Dr. E. V. Abbott was appointed assistant in plant pathology July 1 and is giving most of his time to the study of diseases of sugar cane. Other additions to the station staff include J. J. Munson, professor of mechanical engineering in the university, for research in sugar engineering; E. L. Jordan, professor of animal industry, to have charge of a Purnell fund project; and D. N. Barrow, sugar cane specialist of the extension division, who will devote one-half of his time to a project on testing new seedling canes, in cooperation with the Office of Sugar-Plant Investigations, U. S. Department of Agriculture.

Missouri University and Station.—The department of animal husbandry of the station is beginning work on three new projects. The first of these is an outgrowth of the project entitled Age as a Factor in Animal Breeding, conducted in cooperation with the Bureau of Animal Industry, U. S. Department of Agriculture, and deals with the fecundity of swine—the normal sexual cycle and as influenced by unfavorable dietary conditions and age as a factor. The second project will consider the methods of handling beef calves prior to weaning, and is also being conducted in cooperation with the Bureau of Animal Industry, the work being carried on at Grain Valley. The third project will be carried on as a part of the cooperative work on factors which influence the quality and palatability of meat, and is entitled Relation of Sex and Age in Cattle and the Kind, Quality, and Quantity of Feed Fed to Cattle, to the Quantity and Quality of Carcasses Which They Produce.

Miss Eva Mae Davis has been appointed to succeed Miss Laurel E. Davis as research instructor in home economics, and will continue the study on the Missouri soft wheat flours for making light bread. The previous work on this project has been restricted to compressed yeast, but it is now planned to use dried yeast and starters.

Montana College and Station.—E. L. Currier, head of the division of farm management, and H. E. Selby, assistant in the same division, have resigned, the latter to accept a position at the Oregon College.

Rhode Island Station.—Recent appointments include Roger B. Corbett, Ph. D., as agricultural economist; Kenneth H. Goodner as assistant in animal breeding and pathology, vice Herman E. Segelin; Mrs. Wilkie L. Hines as home economist; and Andrew E. Stene as pomologist.

Clemson College and South Carolina Station.—The agricultural hall, which was burned April 2 with a loss of approximately $200,000, is being rapidly

reconstructed in such a way that room will be provided for a main library and a station library and at the same time furnish offices for the station workers. The hope is that within a few years this building may be used entirely as a library and a new agricultural building erected.

The station has completed a survey of the supply and demand for farm produce in the nearby city of Greenville. Work will be continued on farm survey projects throughout the State in cooperation with the Smith-Hughes agricultural teachers, several hundred such surveys having already been made.

Director H. W. Barre of this station, who was appointed by the Secretary of Agriculture to the Southern Forestry Research Advisory Committee, has recently been made chairman of the committee on coordination of research. Franklin Sherman, chief research entomologist of the North Carolina Department of Agriculture, has resigned after 25 years' service to become entomologist in the station, succeeding Dr. F. H. Lathrop, who is now in the employ of the U. S. Department of Agriculture, with headquarters in Maine.

Texas College and Station.—On September 3, T. O. Walton, for eight years director of the extension service, was appointed president and assumed his duties immediately thereafter. Dr. W. B. Bizzell, the former president, has accepted the presidency of the University of Oklahoma.

The following changes in the station staff became effective September 1: A. H. Leidigh, formerly assistant director and agronomist in charge of small grain research, became dean of the School of Agriculture of the Texas Technological College, and was succeeded by R. E. Karper, since 1916 superintendent of Substation No. 8 at Lubbock. D. L. Jones was transferred from the superintendency of Substation No. 12 at Chillicothe to that of Substation No. 8, and he in turn was succeded by J. R. Quinby. C. H. Mahoney, assistant in cotton breeding, resigned to become associate professor of horticulture in the Texas Technological College.

A. T. Potts, chief of the division of horticulture, and Dr. G. N. Stroman, agronomist in cotton breeding, resigned to engage in farming, the latter being succeeded by D. T. Killough. Fred Hale, swine husbandman, was appointed chief of that division.

Homer E. Rea was appointed superintendent of Substation No. 5 at Temple August 15, succeeding A. B. Cron. G. T. McNess, since 1911 superintendent of Substation No. 11 at Nacogdoches, has been transferred to the superintendency of the main station farm and has been succeeded by H. F. Morris. E. Hobbs has been appointed entomologist at Substation No. 15 at Weslaco, E. C. Carlyle and R. O. Brooke, assistant chemists, and T. C. Reitch, a 1925 graduate of the college, soil surveyor.

Opening of Texas Technological College.—This State institution, located at Lubbock, formally opened its doors on October 1, with 742 students. The curriculum includes arts and sciences, engineering, agriculture, and home economics. During the first year only freshmen and sophomores are to be admitted, with the junior and senior courses to be added in 1926. An initial State appropriation of $1,000,000 was available for buildings. Among these is a 2-story textile engineering building, 60 by 200 ft., completed at a cost of nearly $200,000 and equipped at a cost of about $140,000, with the purpose of offering a complete course in cotton manufacturing.

A 40-acre tract of land adjoining the college buildings has been set aside to be used for a testing ground for cotton, demonstrations, etc. The college farm contains about 2,000 acres, and it is planned to allow each student to use 1 acre of this each year and to receive the net revenue from it.

EXPERIMENT STATION RECORD

VOL. 53. OCTOBER ABSTRACT NUMBER No. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Some physical and chemical properties of carotin and the preparation of the pure pigment, F. M. SCHERTZ (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 5, pp. 469–474, fig. 1*).—The method of procedure for the preparation of the pure carotin used in obtaining the data reported in a previous paper (E. S. R., 50, p. 713) is described in detail, and data are reported on the solubility of carotin in absolute alcohol, absolute ether, and petroleum ether and on its stability in the various solutions. The method of preparing carotin from carrots is essentially as follows:

The carefully washed carrots are sliced in a power slicer or with a vegetable slicer in pieces about 4 mm. thick, and dried in an oven at a temperature not exceeding 50° C. until dry enough to grind in a power feed mill and then in a vacuum oven for about 12 hours until the greater part will pass through a 40-mesh sieve. The powder thus obtained is extracted in a percolator with pure redistilled petroleum ether, the extraction being conducted slowly overnight without suction, and finally under reduced pressure. The total percolate is concentrated on a water bath at a temperature not exceeding 50° until the carotin crystallizes out. The crystals are purified by dissolving in the least possible amount of chloroform or carbon disulfide, precipitating with small portions of absolute alcohol, and washing with low-boiling petroleum ether. It is stated that from 1 bu. (50 lbs.) of fresh carrots 1.13 gm. of pure carotin crystallizing from petroleum ether and having a melting point of 174° was obtained.

Some physical and chemical properties of xanthophyll and the preparation of the pure pigment, F. M. SCHERTZ (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 6, pp. 575–585, fig. 1*).—Continuing studies previously noted (E. S. R., 53, p. 313), the method of procedure in the isolation and purification of xanthophyll is described in detail, and data are reported on its chemical and physical properties, including its relative oxidation as compared with that of carotin (see above). The best source is considered to be dried green leaves, from 0.5 to 0.8 gm. being obtainable from 2 kg. of material.

Physiological studies on cereals.—II, The occurrence of amino acids and polypeptides in the ungerminated oat kernel, S. L. JODIDI (*Jour. Franklin Inst., 198* (*1924*), *No. 2, pp. 201–211*).—Continuing previous work with wheat (E. S. R., 50, p. 712), the proportions of polypeptide and free amino acid

nitrogen found in four varieties of oats, and calculated on a basis of both the oven-dried kernel and the total nitrogen, are summarized as follows:

Distribution of the nonprotein nitrogen in the ungerminated oat kernel

Variety of oats	Amino acid nitrogen		Peptide nitrogen		Acid amide nitrogen	
	Oven-dry kernel	Total nitrogen	Oven-dry kernel	Total nitrogen	Oven-dry kernel	Total nitrogen
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Swedish Select	0.064	2.48	0.106	4.10	0.051	1.95
Victory	.040	2.02	.073	3.63	.029	1.45
Iowar	.057	2.35	.084	3.49	.046	1.93
Winter Turf	.025	1.65	.032	2.15	.027	1.80

Physiological studies on cereals.—III, The occurrence of polypeptides and amino acids in the ungerminated maize kernel, S. L. Jodidi (*Jour. Agr. Research [U. S.], 30 (1925), No. 6, pp. 587–592*).—Continuing the study noted above, the proportions of polypeptide and free amino acid nitrogen found in three varieties of corn, and calculated on a basis of both the oven-dried kernel and the total nitrogen, are summarized as follows:

Distribution of the nonprotein nitrogen in the ungerminated corn kernel

Variety of corn	Amino acid nitrogen		Peptide nitrogen		Acid amide nitrogen	
	Oven-dry kernel	Total nitrogen	Oven-dry kernel	Total nitrogen	Oven-dry kernel	Total nitrogen
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Four County	0.045	2.65	0.069	4.06	0.032	1.88
United States Selection 77	.040	2.52	.050	3.14	.019	1.19
Hall Gold Nugget Selection 193	.051	3.49	.036	2.47	.021	1.44

Preliminary notes on the composition of the fat of goats' butter, F. Knowles and J. C. Urquhart (*Analyst, 49 (1924), No. 584, pp. 509–514*).—Determinations of the analytical constants of nine samples of fat from goats' butter are reported, with minimum and maximum values as follows: Reichert-Wollny number 24.47 and 27.77, Polenske number 4.9 and 8.7, Kirchner number 16.82 and 18.96, refractive index 1.4541 and 1.4559, iodine number 24.73 and 36.96, and specific gravity at 100° F./100° F. 0.9169 and 0.9346, respectively.

Attention is called to the differences in these values for goats' butterfat and cows' butterfat, particularly in the case of the Polenske number.

The presence of vitamin A in yeast fat, E. M. Luce and I. S. Maclean (*Biochem. Jour., 19 (1925), No. 1, pp. 47–51, figs. 3*).—The fat obtained by the direct extraction of 0.14 gm. dried brewery yeast with ether, when fed as the sole source of vitamin A to rats whose growth had been arrested on an A-deficient diet, promoted growth approaching that secured with 5 drops of cod liver oil. The fat obtained from yeast by extracting with ether the residue left after boiling the yeast with N HCl for 2 hours did not promote growth. Negative results were also obtained with 0.5 gm. of dried yeast (an amount furnishing only about 0.015 gm. of fat) and with 0.5 gm. of yeast incubated in a carbohydrate solution to increase the fat content and then dried. The calcium content

of the bones of the rats receiving the growth-promoting fat was higher than that of the rats in which growth was not induced.

It is concluded that vitamin A occurs in yeast cells in an easily extractable form and is not associated with the residual fat which is more closely retained in the cell. It is considered improbable that the yeast could have absorbed any vitamin A from the medium in which it was grown. This would indicate the direct synthesis of the vitamin by the yeast cell in the absence of direct sunlight. "This result, if definitely established, would be of interest since, in so many instances, solar energy has been shown to play an important part in the production of substances rich in the fat-soluble vitamin."

Crystals of vitamin B from the mung bean, H. H. M. Bowman and M. A. Yee (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 228–231, figs. 3*).—By a modification of the Suzuki method of preparing a concentrated extract of the antineuritic vitamin (E. S. R., 28, p. 168), the authors have obtained from the ground dry mung beans a substance crystallizing in white needles, melting point 320° C., which, injected in 3 mg. doses into the pectoral muscle of pigeons in acute polyneuritis, relieved the symptoms promptly. When administered in the same dosage at intervals of three days to pigeons declining in weight on polished rice, the crystals proved capable of stimulating the appetite and producing an upward trend in the weight curves after each injection.

Allen's commercial organic analysis, edited by S. S. Sadtler, E. C. Lathrop, and C. A. Mitchell (*Philadelphia: P. Blakiston's Son & Co., 5. ed., rev., vols. 1, 1923, pp. VIII+796, pl. 1, figs. 105; 2, 1924, pp. IX+807, pl. 1, figs. 23; 3, 1925, pp. IX+732, figs. 36*).—This is the fifth edition of the first three volumes of this well-known reference work. The subjects considered in these volumes are the same as in the corresponding volumes of the previous edition (E. S. R., 30, p. 309).

A note on the colorimetric estimation of humic matter in mineral soils, T. Eden (*Jour. Agr. Sci. [England], 14 (1924), No. 3, pp. 469–472, fig. 1*).—The colorimetric method developed by Odén for measuring the degree of humification of peat soils (E. S. R., 47, p. 319) has been adapted to mineral soils with satisfactory results for the soils tested. "It is possible that with other soils slight modifications would have to be made in the quantities and concentrations of the reagents used, but the close approximation of duplicates, the regularity of the color intensity curve, and the comparability of the tints themselves indicate that in principle the method can be successfully applied to the estimation of humic matter in mineral soils."

A method for determining the degree of humification of soil organic matter, G. W. Robinson and J. O. Jones (*Jour. Agr. Sci. [England], 15 (1925), No. 1, pp. 26–29*).—The observation reported in a previous paper (E. S. R., 49, p. 316) that hydrogen peroxide removes some but not all of the organic matter present in soils has been made the basis of a method for estimating the approximate degree of humification of the soil. Preliminary studies are reported showing that in soils low in clay and calcium carbonate humified material is rendered soluble by hydrogen peroxide, while fibrous substances such as cellulose and lignins are unaffected.

A method for the estimation of uric acid in poultry excreta, H. E. Woodman (*Jour. Agr. Sci. [England], 14 (1924), No. 3, pp. 413–427*).—A detailed description is given of the development of a new method for this determination.

The method consists essentially in removing the pigment from a weighed amount (8 to 10 gm.) of the sample by successive treatment with cold alcohol and ether, decomposition of the ammonium urate present by hydrochloric acid, extraction of the uric acid by a solution of lithium hydroxide and its precipita-

tion as ammonium urate by ammonium chloride, decomposition of the ammonium urate with hydrochloric acid, and determination of the amount of uric acid by direct weighing or titration with N/20 potassium permanganate solution.

A direct method for the estimation of glucose and other carbohydrates, E. KNECHT and E. HIBBERT (*Jour. Chem. Soc.* [London], *125* (*1924*), *Oct.*, *pp. 2009–2012*).—The method depends upon the reduction of phenylglucosazone with excess of standard titanous chloride in the presence of sodium tartrate, followed by back titration with crystal scarlet. The technique as applied to glucose is essentially as follows:

To 10 cc. of a solution of from 0.1 to 0.2 gm. of glucose in 100 cc. of water are added 1 cc. of a saturated solution of sodium tartrate and 0.25 gm. of phenylhydrazine dissolved in acetic acid. The mixture is heated for 10 minutes on a briskly boiling water bath. A known amount of titanous chloride (which must be considerably in excess) is added and the solution boiled for 1 or 2 minutes over a free flame while carbon dioxide is being passed into the flask. An excess of hydrochloric acid is added and the solution titrated while still hot with a solution of crystal scarlet standardized against the titanous chloride solution to a permanent red color.

The method is thought to be of application not only to the quantitative estimation of mono- and disaccharides but also to the products of hydrolysis of the more complex carbohydrates and other substances yielding carbohydrates on hydrolysis.

Determination of maltose in the presence of other reducing sugars by the use of Barfoed's solution [trans. title], P. NOTTIN (*Ann. Falsif.*, *17* (*1924*), *No. 192*, *pp. 538–540*; *also in Bul. Assoc. Chim. Sucr. et Distill.*, *42* (*1924*), *No. 5*, *pp. 143–145*).—With reference to the method described by Le Grand for determining maltose or lactose in the presence of other sugars (E. S. R., 45, p. 806), the author states that maltose reduces Barfoed's solution to the same extent as a quantity of glucose equal to 0.07 of the weight of the maltose and Bertrand's solution to the same extent as a quantity of glucose equal to 0.572 of the weight of the maltose. It is thought that these factors should be taken into consideration in the use of this method.

The determination of the baking quality of flours [trans. title], BRAUN (*Ann. Falsif.*, *17* (*1924*), *No. 188*, *pp. 269–272*).—The author recommends as a satisfactory test for the baking quality of flour the separation of the gluten by the usual kneading method and the analysis of three portions of the gluten for water, total nitrogen, and gliadin nitrogen, respectively. The ratios of gliadin nitrogen to gluten nitrogen in 16 samples of flour thus examined varied from 63.7 to 89.9 per cent, and the results were in keeping with the known quality of the flours examined.

Methods of examining cacao butters [trans. title], A. KOEHLER (*Ann. Falsif.*, *17* (*1924*), *No. 186*, *pp. 133–146*, *fig. 1*).—As a means of detecting adulteration in cacao butter the author recommends a turbidity test which consists essentially in measuring the volume of aceto-acetic ether required to produce turbidity in a known volume of the sample dissolved in chloroform. In unadulterated samples the amount of aceto-acetic ether required for a given amount of cacao butter is remarkably constant, but in adulterated samples there is an increase in the volume required which is detectable when the adulterant is present to the extent of 15 per cent or more. The technique of the determination is described in detail.

The Bellier reaction applied to the detection of adulteration in cacao butter [trans. title], N. B. CLEMENCET (*Ann. Falsif.*, *17* (*1924*), *No. 186*, *pp. 146–153*).—A study of the sensitivity of the Bellier test for cacao butter

alone or mixed with other fats is reported, with the conclusion that the test is a good criterion of the purity of cacao butter and can be used to detect adulteration of cacao butter with other fats.

The simplified molecular constant: Its application to the milk of Loir-et-Cher [trans. title], F. ORRÉ and M. FOURNIER (*Ann. Falsif., 17 (1924), No. 189, pp. 344–352*).—To determine the value of the simplified molecular constant C. M. S. as described by Porcher (E. S. R., 51, p. 713) for the detection of watered milk, the authors have conducted the determination on samples of milk obtained from 80 cows on 10 farms in different regions of the Department of Loir-et-Cher, France.

These analyses showed that while the greater part of the samples had a C. M. S. higher than 70 and the average for each group was above 71, in a certain number of individual cases the value fell below 70. It is concluded that in this department the minimum value of 70 would not necessarily signify adulteration if the sample consisted of the milk of a single cow.

Present practices in the adulteration of milk (skimming and watering) [trans. title], F. BODROUX (*Ann. Falsif., 17 (1924), Spec. No., Aug.–Sept., pp. 112*).—This is a discussion of the present situation in France concerning the adulteration of milk, with a summary of the official methods for the detection and control of such adulteration.

The routine examination of dairy products with special reference to the Mojonnier tester, L. H. LAMPITT, E. B. HUGHES, and M. BOGOD (*Analyst, 49 (1924), No. 582, pp. 413–420*).—In the authors' experience consistent results can be obtained in the determination of the total solids of milk products by means of the Mojonnier tester, the method requiring 21 minutes for a single determination and 30 minutes for duplicate determinations.

A comparison of various methods of determining fat showed the Mojonnier modification of the Roese-Gottlieb method to give accurate results. For most products two extractions are considered sufficient, but for spray process milk powder three are recommended. The time for a single determination is given as 30 minutes and for both fat and total solids 35 minutes.

For the routine determination of fat in milk powders a modified Gerber method is recommended.

The citric acid content of milk powder, D. W. STEUART (*Analyst, 49 (1924), No. 583, pp. 465–467*).—Samples of fresh milk and of full cream and skim milk powders were analyzed for citric acid by weighing it as the pentabromacetone and as the double salt of mercury acetone dicarboxylate with basic mercury sulfate.

The fresh milk contained 0.158 per cent of anhydrous citric acid. The average values for the full cream milk powders and skim milk powders were 1.16 and 1.55 per cent, respectively.

A study of the Tisdall method for the determination of blood serum calcium with a suggested modification, E. P. CLARK and J. B. COLLIP (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 461–464*).—The Kramer-Tisdall method of determining serum calcium, as modified by Tisdall (E. S. R., 50, p. 112), has been further modified by substituting one washing of the precipitate with 3 cc. of ammonia water for two washings with 4 cc. each of dilute ammonia, and by allowing the tubes to drain for 5 minutes. The modified method, if carried out exactly as described in the detailed procedure, is said to have an error of not more than 2 per cent.

Estimation of sugar in urine by means of Fehling's solution with methylene blue as internal indicator, J. H. LANE and L. EYNON (*Analyst, 49 (1924), No. 581, pp. 366–371*).—It has been found possible to use methylene

blue as the internal indicator for Fehling's solution in the analysis of urine for reducing sugars by first rendering the urine neutral to litmus. In the preliminary test, 10 cc. of Fehling's solution is used with 20 cc. of the neutralized urine, followed after the liquid has been boiled by 10 drops of a 1 per cent aqueous methylene blue solution. If the methylene blue is completely decolorized within 15 seconds, the urine contains more than 0.25 per cent of reducing sugars and the procedure is completed as previously described for sugar solutions (E. S. R., 49, p. 310). If it is not completely decolorized, the titration is continued by adding the urine in 5- or 10-cc. amounts to the boiling liquid and continuing the boiling for about 15 seconds after each addition until all trace of color has disappeared.

The determination of the content of m-cresol in crude cresol [trans. title], W. Qvist (*Ztschr. Analyt. Chem., 65 (1925), No. 8, pp. 289–314, figs. 2*).—Methods are outlined and discussed for the determination of *m*-cresol in crude cresols rich in phenol, picric acid, xylenol, or other phenols of high boiling point.

For mixtures of *o*-, *m*-, and *p*-cresols, the method of Raschig,[1] with slight modifications, is employed. In place of ordinary concentrated nitric acid, 60 per cent fuming and 40 per cent concentrated nitric acid are used, and the figure 1.786 is used in place of 1.74 for calculating the amount of *m*-cresol from the weight of trinitro-*m*-cresol.

Mixtures of picric acid and trinitro-*m*-cresol with less than 25 or more than 70 per cent picric acid have significant solidification points from which a curve has been constructed.

The content of *m*-cresol in phenol-rich cresols can be determined by washing the nitro product thoroughly with water, which dissolves the picric acid but leaves the trinitro-*m*-cresol. In crude cresols rich in xylenol or other high boiling phenols, the crude nitro product can be decomposed with naphthalene in hot alcohol solution. On cooling, a double compound of naphthalene and trinitro-*m*-cresol crystallizes out. The conduct of *m*-cresol in crude cresols, which contain both low and high boiling phenol, can be determined by a combination of the above methods.

The estimation of "polysulphide" sulphur in spray materials, W. Goodwin and H. Martin (*Jour. Agr. Sci. [England], 15 (1925), No. 1, pp. 96–105, fig. 1*).—The principal methods which have been proposed for estimating polysulfides in spray materials are summarized, with references to the literature, and a study of one of them, the Chapin method (E. S. R., 35, p. 207), is reported.

This method, with slight modifications to increase the rapidity and ease of manipulation, is recommended as giving satisfactory results in general routine work. The principal change from the original method is the omission of the addition of disodium phosphate and subsequent filtration.

The normal juice factor: Its possibilities as a basic control factor in the chemical control of cane sugar factories, A. H. Warren (*Philippine Agr., 13 (1925), No. 9, pp. 363–396, fig. 1*).—This paper, which should be consulted in the original, consists of a discussion of the value of the normal juice factor in the chemical control of cane sugar factories. This factor is defined as follows:

$$\text{Normal juice factor} = 100 \times \frac{\text{Brix of normal juice}}{\text{Brix of crusher (first expressed) juice}}$$

Formulas are derived for determining the Brix of normal juice by an indirect method, for the normal juice factor in terms of the variables involved, and for

the dilution percentage of normal juice. The effects upon the variables of various errors in the determination are outlined, and the practical application of the normal juice factor to laboratory control is discussed.

Indicators in the sugar laboratory, H. A. Cook (*Sugar [New York], 27 (1925), Nos. 3, pp. 117, 118; 4, pp. 172–174*).—This discussion of the use of indicators in sugar refining is based upon the literature on the subject and the author's experience at the experiment station of the Hawaiian Sugar Planters' Association.

The most practical method for H-ion concentration determinations in cane juice and sirup is considered to be the spot test as described by Perkins (E. S. R., 50, p. 11), with a suitable color chart for comparison. To cover all the reactions found in the sugarhouse from raw juice to clarified sirup, the indicators recommended are bromocresol purple, bromothymol blue, phenol red, cresol red, thymol blue, and phenolphthalein. In practice these may be reduced to phenolphthalein, with phenol red, cresol red, or thymol blue. When the phosphorus content of the juice is such that the liming can be carried to the point recommended in clarifying practice, phenolphthalein is considered to be the indicator of choice. When the cold juice is limed to a slight color with phenolphthalein, the reaction is about pH 8.8.

The preservation of olives for oil [trans. title], R. Marcille (*Ann. Falsif., 17 (1924), No. 190, pp. 395–404*).—In this investigation of suitable means of storing olives to be used for the preparation of oil, a method of determining the acidity of the oil of olives without resorting to grinding or pressing was developed as follows:

About 20 olives are pitted, the pulp lightly crushed and triturated in a mortar with successive small portions of anhydrous sodium sulfate, the oil taken up by dry redistilled carbon disulfide, and the solution filtered into a tared evaporating dish of about 70-cc. capacity. The process is repeated until about 50 cc. of the filtered liquid has been obtained. The evaporating dish is allowed to stand in a current of air until the carbon disulfide has evaporated spontaneously, and is then weighed and the acidity of the oil determined by dissolving in neutralized ether and titrating with an alcoholic solution of sodium hydroxide, with phenolphthalein as indicator.

Using this method, the natural acidity of several varieties of olives was determined under various conditions, and several methods of storing olives were tested by the extent of development of acidity in the olives after standing. The least change was found to take place when the olives were stored in the absence of air or in an atmosphere of carbon dioxide. To furnish these conditions on an industrial scale, the use of an ordinary silo was found to be practical. Data are presented showing that after storage in a silo for 35 days there was no appreciable increase in acidity in the olives, and the oil made from them was of an agreeable taste and flavor.

It is recommended that in establishments for making olive oil the olives should be kept in closed silos, or in chambers which can be hermetically sealed and through which a current of carbon dioxide can be passed.

National Cleaner and Dyer book of technical notes, Volume II, [compiled by] R. Denney (*Chicago: Dowst Pub. Co., 1924, vol. 2, pp. 308+IX*).—The subject matter of this reference volume on problems connected with various cleaning processes for textiles has been compiled from the *National Cleaner and Dyer* for 1922 and 1923. While the point of view throughout is that of the professional cleaner and dyer, the book contains many suggestions of value to the housewife concerning cleaning, dyeing, and the removal of stains.

METEOROLOGY

Some factors of climatic control, W. J. HUMPHREYS (*Sci. Mo., 20 (1925), No. 5, pp. 449-459*).—Briefly reviewing the subject, the author concludes that "of the many factors of climatic control all those of extraterrestrial or cosmical origin either are demonstrably small or unproved and, apparently, unnecessary to assume in accounting for the known climatic changes of the past." He holds that the earth has produced its own climatic changes "through such potent agencies as land and water distribution, land elevation, oceanic circulation, atmospheric circulation, volcanic dust, and surface covering."

The dependence of the earth's weather on variations of the sun, H. H. CLAYTON (*Science, 61 (1925), No. 1586, p. 550*).—This is an abstract of a paper presented at the Washington meeting of the National Academy of Sciences, April 25 and 26, 1925. The general conclusion drawn from various observations and investigations reviewed is that "there is an intimate relation between solar changes and weather, and the results promise to revolutionize the art of weather forecasting."

Phenology: Responses of life to the advance of the seasons, C. F. BROOKS and F. V. TRIPP (*Bul. Amer. Met. Soc., 6 (1925), No. 3, pp. 47, 48*).—Brief references are made to phenological observations in the United States and Canada which indicate the importance of such observations from the viewpoint of their wide application and value in the study of fundamental principles of bioclimatics. Comparatively little has been done along this line in the United States. In Canada, on the other hand, phenological observations are carried on in every province.

The use of solar energy by field crops [trans. title], A. G. DOĬARENKO (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 1, pp. 7-21, figs. 3*).—The determinations of the calorific value per kilogram (2.2 lbs.) of the dry matter of various crops, including wheat, oats, rye, potatoes, beets, clover, vetch, lupines, and flax, and the percentages of the available solar energy stored by these crops are reported. The calorific value per kilogram varied from 6,552 with flax to 4,264 with potatoes. A certain direct relation between intensity of the solar radiation and calorific value of the crops was observed. The average coefficient of utilization of solar energy varied from 4.79 per cent with lupines to 1.91 per cent with beets. Studies of energy storage at different stages of growth showed a maximum of 8.78 per cent for winter wheat and 7.58 per cent for rye in the period between tillering and heading. The author hopes to undertake a comprehensive study of the utilization of solar energy by plants in different parts of the world.

Monthly Weather Review, [March–April, 1925] (*U. S. Mo. Weather Rev., 53 (1925), Nos. 3, pp. 99-139, pls. 13, figs. 13; 4, pp. 141-185, pls. 15, figs. 9*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for March and April, 1925, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 3.—An Account and Analysis of the Meisinger Free-balloon Flights (illus.), by V. E. Jakl; On the Mean Variability in Random Series, by E. W. Woolard; Energy Distribution in the Visible Spectrum of Sunlight and Skylight (illus.), by H. H. Kimball; Recent Oceanic Phenomena Along the Coast of South America, by R. C. Murphy.

No. 4.—The Tornadoes of March 18, 1925 (illus.), by A. J. Henry; The Tornado of April 5, 1925, near Miami, Fla., by R. W. Gray; Ocean Temperatures Across the Equator (illus.), by W. J. Humphreys; Effect of Local

Smoke on Visibility and Solar Radiation Intensities (illus.), by I. F. Hand; and Seasonal Precipitation in California and Its Variability, [I] (illus.), by B. M. Varney.

Climatological data for the United States by sections, [March–April, 1925] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 12 (1925), Nos. 3. pp. [210], pls. 4, figs. 5; 4, pp. [193], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1925.

Climate [of the cut-over lands of northern Idaho], G. R. McDole and J. H. Christ (*Idaho Sta. Bul. 136 (1925), pp. 5–7*).—Data for precipitation, temperature, and frost-free period are summarized. There are shown to be wide variations in precipitation and temperature, dependent largely upon elevation. Precipitation is "heavier in the eastern portion and in the more mountainous localities, decreasing in the western portions and in the lower valleys. Precipitation over the entire section is well distributed throughout the year. The months of lightest rainfall are July and August, and the months of heaviest precipitation are November, December, and January." "In some of the lower valleys temperatures are exceptionally mild, in the more elevated sections the winters are rather long and cold, but on the whole the climate of the section is not as severe as its altitude and latitude might lead one to expect. It lies in the belt of prevailing westerly winds, and the mountains on the east protect the region from the cold waves that move down into the United States from Canada."

Climatic characteristics and crop risks in the Williston area, A. C. Kuenning (*North Dakota Sta. Bul. 190 (1925), pp. 5–10, 25, 26, figs. 3*).—Data for precipitation and temperature during 45 years, 1879–1923, in this area are summarized and briefly discussed with reference to crop yields. The average annual precipitation has been 14.67 in. The seasonal (April to August) precipitation has been 10.01 in. The average frost-free period has been 128 days (May 15 to September 20), but is quite variable. The conclusions drawn are as follows: "(1) Moisture is the principal limiting factor in crop production, (2) about one-third of the seasonal rainfall will come in June, (3) about one-half of the seasons will be 'wet' and one-half 'dry' with a few of the latter extremely so, (4) crop failures are likely to come in series, (5) wheat is more dependent on reserve moisture and corn on seasonal moisture." The adaptation of cropping and culture to the climatic conditions is briefly discussed.

Weather conditions at Wooster in 1923 (*Ohio Sta. Bul. 382 (1924), pp. 62–67*).—Data for monthly and annual temperature, precipitation, and cloudiness at the experiment station at Wooster, Ohio, and for temperature and rainfall at the experiment farms at Carpenter, Germantown, Strongsville, Batavia, Canfield, Marietta, Mount Healthy, and Paulding are reported for 1923 and compared with State and local averages.

The mean annual temperature at Wooster in 1923 was 50.2° F. as compared with the 36-year average of 49.4°. The annual precipitation was 36.3 in. as compared with the 36-year average of 39.34 in. The precipitation during the growing season, March to September, was 20.73 in. as compared with the 36-year average of 25.64 in. The annual and seasonal rainfall at Wooster was below that of the State for 1923 and also below the State averages for 36 years.

Relation between climate and sugar production in Java [trans. title], T. A. Tengwall and C. E. van der Zyl (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1924, No. 4, pp. 65–139, figs. 18; abs. in Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 1, p. 170*).—

The sugar crop of Java is shown to be greatly influenced by climatic conditions, particularly the monsoon rains. Correlations were found which indicate that the sugar crop may be approximately calculated from the previous October and November rainfall and the time of planting.

Rainfall observations for the tobacco growing region of the eastern coast of Sumatra, 1924 [trans. title] (*Meded. Deli Proefsta. Medan, 2. ser., No. 39 [1924], pp. [2]+11+[1]*).—Detailed tabulated data with brief discussion are given.

SOILS—FERTILIZERS

Soil colloids as simple suspensions, E. B. Powell (*Soil Sci., 19 (1925), No. 5, pp. 407–409, fig. 1*).—Studies conducted at the Missouri Experiment Station on the theory of colloidal swelling in soils with rise in temperature as a factor affecting the rate of percolation through heavy subsoils are briefly reported. It was found that the swelling of colloids is insignificant over the temperature range used and can not be a contributor to the variation in rate of percolation.

Investigations on new methods for the determination of the reaction and lime requirement of soils [trans. title], H. R. Christensen (*Internatl. Mitt. Bodenk., 13 (1923), No. 3–4, pp. 116–146, figs. 3*).—A comparison is made of several new methods of determining the reaction and lime requirements of Danish soils, with particular reference to the reaction and lime needs of different important crops.

The determination of H-ion concentration supplemented by the Azotobacter growth test seems to be the procedure most applicable to Danish agricultural soils and crops. The reaction of these soils varies between pH 4.6 and 8. It has been found that under the soil and cropping conditions of Denmark a pH value of 5.7 indicates a heavy lime requirement, while a pH between 5.7 and 6 indicates a need for lime. A pH above 6.8 indicates that there is no need for lime, but between 6.1 and 6.8 the Azotobacter growth test is considered desirable to determine what practice to follow.

The buffer action of some Burma soils, J. Charlton (*India Dept. Agr. Mem., Chem. Ser., 7 (1924), No. 5, pp. 101–121, pl. 1, figs. 5*).—Studies of the buffer action of certain Burma soils are reported, in which the range of fertility with reference to reaction is assumed to lie between the limits pH 4.5 and pH 9.5. Noncalcareous Burma soils growing rice exclusively under rainfall gave a value for buffer action against acid per unit of pH varying from 0.92 to 3.42, with a mean of 2.04. The buffer action against alkali is considered to be relatively unimportant in these soils. In the noncalcareous soils the average value per unit of pH was 4.94, and it was higher in the more productive soils. The only inference drawn with any certainty is that the higher the buffer action against alkali the greater is the lime requirement over certain pH ranges. The method used for determining buffer action is described.

The origin of black turf soils in the Transvaal, B. de C. Marchand (*So. African Jour. Sci., 21 (1924), pp. 162–181*).—An analytical discussion of the black turf soils in the Transvaal is presented.

Soil survey of Iowa.—Reports 35–37, W. H. Stevenson, P. E. Brown, et al. (*Iowa Sta. Soil Survey Rpts. 35 (1924), pp. 72, pls. 2, figs. 14; 36, pp. 72, pl. 1, figs. 15; 37, pp. 72, pl. 1, figs. 16*).—Three county soil surveys are presented, which include analyses and greenhouse and field experiments to determine the composition, fertilizer requirements, and crop adaptations of the pre-

vailing soil types, and information on methods of conducting soil surveys in Iowa.

No. 35, Dubuque County soils.—This is an area of 384,640 acres lying partly in the Mississippi loess and partly in the Iowan drift soil areas in northeastern Iowa. The topography is quite variable in the different parts of the county, the western portion being somewhat less hilly and rolling than in the eastern part. The drainage as a whole is quite complete.

The soils are of loessial and glacial origin, and are grouped as drift, loess, terrace, swamp and bottom land, and residual soils. The loess soils cover 71.4 per cent of the entire area. Including river wash, 18 soil types of 13 series are mapped, of which the Clinton and Tama silt loam loess soils cover 50.4 and 19.6 per cent of the area, respectively. The soils of the county are said to be practically all acid in reaction, and many are not particularly well supplied with organic matter. The content of phosphorus in these soils is not high, and in most cases is said to be rather low.

No. 36, Emmet County soils.—This is an area of 251,250 acres lying entirely within the Wisconsin drift soil area in north-central Iowa. The topography is generally gently undulating to rolling. Drainage conditions in the county are naturally rather poor.

The soils of the county are all of glacial origin, and are grouped as drift, terrace, and swamp and bottom land soils. The drift soils cover 89.1 per cent of the entire area. Including gravel pits, muck, peat, and meadow, 18 soil types of 8 series are mapped, of which the Clarion loam drift soil covers 69.8 per cent of the area. While many of the soils of the county are not acid in reaction, in several cases a considerable lime requirement has been found. Most of the soils are fairly well supplied with organic matter, but phosphorus is not abundant in any of them.

No. 37, Dickinson County soils.—This is an area of 240,640 acres lying in the Wisconsin drift soil area in northwestern Iowa. The topography varies from rolling to hilly in the northern part to level to gently undulating in the southern part. The natural drainage system of the county is poor.

The soils are of glacial origin, and are grouped as drift, terrace, and swamp and bottom land soils. The drift soils cover 75.3 per cent of the entire area. Including muck, 19 soil types of 10 series are mapped, of which the Clarion loam and Webster silt loam drift soils and the Lamoure silty clay loam swamp and bottom land soils cover 40.4, 10.5, and 15.8 per cent of the area, respectively. The phosphorus supply of the soils is said to be usually quite low.

[Farming practices for the cut-over lands of northern Idaho: Soils], G. R. McDole and J. H. Christ (*Idaho Sta. Bul. 136* (*1925*), *pp. 8–11, fig. 1*).—Practical information on the treatment of cut-over lands in northern Idaho is presented.

Investigations from the memoirs of Alfred Koch relating to the nitrogen phenomena of cultivated soils [trans. title], A. Rippel (*Jour. Landw.*, *72* (*1924*), *No. 1, pp. 18–52*).—The results of several studies relating to nitrogen activities in cultivated soils, taken from the notes of Koch, are briefly summarized.

These indicate that nitrogen fixation takes place in soil only when easily assimilable carbon compounds are present. It is also brought out that under natural conditions the roots and stubble from continuous rye growing should make possible the fixation of sufficient nitrogen to improve markedly the yields of subsequent crops. The favorable influence of fallow in making the nitrogen supply of the soil more available to crops is also indicated.

The temperature and moisture factors in nitrate production, J. C. Russel, E. G. Jones, and G. M. Bahrt (*Soil Sci.*, *19* (*1925*), *No. 5, pp. 381–398*,

figs. 5).—Studies conducted at the Nebraska Experiment Station on the effec of temperature and moisture on nitrate production in two typical Nebrask soils are reported. The temperatures studied ranged from 5 to 55° C., and th moisture contents from the hygroscopic coefficient to 1.25 times the moistur equivalent.

Nitrate production was found to be comparatively slow at 5°, but it increase rapidly as the temperature increased and reached a maximum at 35°. Above this point it became slower, and ceased altogether at 55°. Nitrate productior was insignificant at moisture contents as low as the hygroscopic coefficient, bu increased with the moisture content up to the highest degree of wetnes studied.

North Platte soil from western Nebraska produced as much nitrate at 5° in a period of 3 weeks as Lincoln soil from eastern Nebraska produced in the same time at about 20°, and as much in 7 days at a wetness of 1.5 times the hygroscopic coefficient as the Lincoln soil did in 22 days at the moisture equivalent. The practical significance of these results is elaborated on.

Dependence of denitrification on the reaction of the medium [trans. title], T. M. Zakharova (*Trudy Nauch. Inst. Udobr.* (*Trans. Inst. Fert.* [*Moscow*]). No. *15* (*1923*), *pp.* [*23*]).—Studies are reported which showed that the decomposition of nitrates by bacteria is especially marked at reactions of from pH 7 to 8.2. The process was retarded at pH values of from 6.1 to 6.4, and stopped at a low limiting pH value of 5.5 and at a high limiting pH value of 9.8. Nitrite decomposition increased in a weekly acid medium. In connection with these results strontium nitrate was found to be a more stable source of nitrate than potassium nitrate, since it produced less alkalinity.

The effects of alkali salts on bacteriological activities in soil, I–III, W. M. Gibbs, H. W. Batchelor, and H. P. Magnuson (*Soil Sci.*, *19* (*1925*), *No. 5, pp. 343–379, figs. 9*).—Three contributions from the Idaho Experiment Station on the effects of alkali salts on bacterial activities in soils are repored.

I. *Ammonification* (pp. 343–356).—These studies dealt with the effect of the carbonate, chloride, and sulfate of sodium singly and in various combinations on ammonia formation in soil, determined immediately after the addition of the salts, at the end of 9 months and 17 days, and again at the end of 14 months and 25 days.

Sodium carbonate stimulated ammonia formation from blood at the initial period, and the stimulation was more marked at each successive period. Sodium chloride was toxic at the initial period, but stimulating at the second and third periods. The toxicity was not directly proportional to the total salt recovery. Sodium sulfate was toxic at the initial and second periods, but stimulating at the third period, and the toxicity was not directly proportional to the total salt recovery.

All combinations of two of the salts were toxic at the initial and second periods, but in many cases this toxicity was overcome at the third period. There was doubtful antagonism of the salts at the initial period and none at the second and third periods as measured by the ammonification of blood. The combinations were often more toxic toward ammonia formation than would be expected of the single salt treatments. In this connection combinations of the sulfate and chloride were toxic at the third period, whereas neither salt was toxic at the third period when applied alone.

There was in general a more marked toxicity of the three-salt combinations at the third than at the second period. There seemed to be no antagonism of the salts in the second and third periods, and doubtful antagonism in the first period as measured by ammonia formation.

II. *Nitrification* (pp. 357–369).—The effects of the three salts noted above on nitrate formation from ammonium sulfate were also studied. These effects were determined immediately after the addition of the salts, at the end of 15 days, again at the end of 9 months and 17 days, and finally at the end of 14 months and 25 days.

A sodium carbonate application of 0.2 per cent had the immediate effect of stimulating nitrate formation, 0.4 per cent had no effect, and applications of 0.6 and 0.9 per cent were toxic. Sodium chloride was slightly toxic throughout from original applications of 0.1, 0.2, and 0.4 per cent, except in the lowest concentration. The toxicity remained throughout the four periods of the experiment, regardless of the gradually decreasing water-soluble chloride.

Sodium sulfate in applications of from 0.2 to 0.4 per cent slightly stimulated nitrate formation at the initial period, while applications of 0.6 and 0.9 per cent retarded it. The toxicity disappeared at the first and second periods, but returned at the third in all concentrations. Sodium carbonate counteracted the toxicity of sodium chloride at the first, second, and third periods and in some cases at the initial period. Combinations of the chloride and sulfate were in general slightly toxic, while combinations of the carbonate and sulfate were in general stimulating. Combinations of the three salts were in general stimulating, particularly where the carbonate concentration was not materially below that of the chloride or sulfate.

There was a general tendency for any toxic action resulting from applications of these salts, either singly or in combinations of two or three, to disappear as time progressed, with the exception of the sulfate applied alone. Chemical analyses at the stated periods showed conclusively that any toxic or stimulating action was not proportional to total salt recovery within the limits of these experiments.

III. *Ammonification, nitrification, and crop yield* (pp. 371–379).—The above experiments were extended to show the effect of the salt treatments on the growth and yield of two crops of wheat.

Sodium carbonate was decidedly toxic to plant growth at the first period and was stimulating at the second period at the two lowest concentrations only. No crop could be obtained at a concentration of 0.319 per cent of recoverable water-soluble salt, while at 0.202 per cent the yield was greatly reduced. Only the highest concentration of sodium chloride used was toxic to plant growth at the first period, and at the second period it stimulated plant growth.

Sodium sulfate had practically no effect on crop growth at the first period but stimulated it at the second period. The two- and three-salt combinations were usually toxic to plant growth at the first period and stimulating at the second period.

The effect of the summer fallow upon soil protozoa in Egypt, E. McK. Taylor and A. C. Burns (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 52 (1924), pp. [1]+10*).—In a continuation of this work (E. S. R., 51, p. 722), studies are reported which showed that a factor in the soil detrimental to nitrate production can be suppressed by heating the soil to 58° C. If protozoa are present in the soil in the cyst state, as in the case of sharâqi soils, the factor detrimental to nitrate production can be suppressed without extinction of the protozoa owing to the fact that these, when in the cyst form, can withstand comparatively high temperatures.

It was found that protozoa in soil that was heated in the laboratory to a temperature of 58°, as also in the soil that was subjected to even higher temperatures in the field under sharâqi conditions, rapidly became activetrophic when suitable moisture and temperature conditions were reestablished as the

result of irrigation. The results are taken to indicate that the protozoan theory of partial sterilization does not account for the observed facts in Egypt. An alternative theory, based on the modification of the colloidal properties of the soil by heat, is tentatively advanced.

[Farming practices for the cut-over lands of northern Idaho: Fertilizers], G. R. McDole and J. H. Christ (*Idaho Sta. Bul. 136 (1925), pp. 18–22*).—Practical information is given on the use of fertilizers on the cut-over lands of northern Idaho.

Fertilizing the greenhouse soil (*Ohio Sta. Bul. 382 (1924), pp. 39, 40*).—Studies to determine to what extent the use of manure on greenhouse soils can be reduced and supplemented with chemical fertilizers without reducing the crop indicated a beneficial effect of the fertilizers during the first year and a distinct increase during the second year over the first.

Three-year compost rotation experiment [at the North Louisiana Station], S. Stewart (*Louisiana Stas. Rpt. 1924, p. 37*).—The results of long-time experiments with cotton, corn and peas, and oats receiving an application of a compost of green cotton seed, stable manure, and acid phosphate are briefly summarized.

Intensive nitrifying bed as a means of preventing nitrogen losses from cattle urine, N. V. Joshi (*Agr. Jour. India, 20 (1925), No. 1, pp. 20–36, figs. 3*).—Experiments to determine the possibility of preventing nitrogen losses from cattle urine by passing this material over intensive nitrifying beds are reported.

It was found that there are two ways of accomplishing this result. In one the urine is passed over a nitrifying bed and ultimately recovered as a solution of nitrates, and in the other the urine is absorbed by means of a specially prepared or activated soil. In the first method pumice or broken bricks served as suitable substrata for the organisms in the nitrifying bed, and the depth of the layer of liquid to be nitrified had a great influence on the nitrification process. Urine could not be nitrified directly without dilution in the nitrifying beds. With the most active bed prepared, it was necessary to dilute the urine with ten times its quantity of water.

In the second method soil prepared by previously nitrifying some nitrogenous material in smaller quantities and washing out the nitrates was used for the absorption of urine. The object of preparing the soil was to activate the nitrifying organisms and make the soil capable of nitrifying the large quantities of nitrogen in the urine rapidly, thus preventing nitrogen losses. The practicability of this method is discussed.

Investigation of the solubility of different phosphates [trans. title], H. R. Christensen (*Tidsskr. Planteavl, 29 (1923), No. 4, 513–574, figs. 2; abs. in Biedermann's Zentbl., 53 (1924), No. 9, pp. 314, 315*).—An investigation of the solubilities of 61 different phosphates, including 32 raw phosphates, is reported, in which determinations were made of total phosphoric acid and phosphoric acid soluble in 2 per cent citric acid, in citrate solution, and in carbonated water. In addition the ability of the different phosphates to support the growth of Azotobacter in mannite solution was tested.

The contents of total phosphoric acid in the raw phosphates varied from 15 to 42 per cent, and the solubility in 2 per cent citric acid varied from 8.7 to 44.8 per cent. No relation was observed between the contents of citric acid soluble, citrate soluble, and carbonic acid soluble phosphoric acid in the raw phosphates and their contents of chlorides and fluorides. Of the prepared phosphates, the Bernard and Tetra phosphates acted like raw phosphates, while the Rhenania, Vesta, and Supra phosphates were relatively

easily soluble. Extraction with carbonated water resulted first in the separation of the calcium carbonate. A second extraction separated greater quantities of phosphoric acid.

The biological studies with Azotobacter showed that most of the raw phosphates are not able to supply the phosphoric acid necessary for the nutrition of these organisms. On the other hand, small additions of Thomas meal favored the growth of Azotobacter, while larger quantities hindered it. Bone meal also hindered Azotobacter growth. It was possible by the Azotobacter test to distinguish between tri- and dicalcium phosphates.

Some factors influencing the solubility of phosphorus in soil—acid phosphate mixtures, C. H. SPURWAY (*Soil Sci., 19 (1925), No. 5, pp. 399–405, fig. 1*).—Studies conducted at the Michigan Experiment Station are reported, which showed that when four sandy loam soils of different degrees of reaction and containing different quantities of active bases are placed on a comparative basis by substituting for their active soil bases the base radical of calcium chloride, magnesium chloride, and potassium chloride separately, the solubility of phosphorus applied to them as calcium phosphate in various amounts is proportional to the quantities applied, to the quantities of bases fixed in the soils, and in the order calcium, magnesium, and potassium. This is considered to be evidence that the phosphates of these bases are formed in the soils.

The potassium chloride treatments increased the solubility of the applied phosphorus in all cases, and the magnesium chloride treatments in all cases but three. The calcium chloride treatments decreased the solubility of the phosphorus in the neutral and alkaline soils and increased it in the acid soils, except in three cases of heavy phosphate applications.

In some soils it appeared that the soil factors regulating the solubility of natural soil phosphorus have the same influence on the solubility of applied soluble phosphorus. The quantity and proportion of hydrolyzing soil bases were important soil factors influencing the fixation and solubility of phosphorus in soils.

Basic slag and mineral phosphates on hill pastures, W. G. SMITH (*Scot. Jour. Agr., 6 (1923), No. 3, pp. 253–267, figs. 4*).—In a contribution from the Edinburgh and East of Scotland College of Agriculture, data from experiments on the use of basic slag and mineral phosphates on hill pastures are briefly reported. Attention is especially drawn to the influence which such phosphates have on the botanical composition of the pasture.

The experiments as a whole are considered to prove that mineral or rock phosphates are valuable top-dressings for grassland and are comparable to basic slag in this respect. They were observed to give better results where the rainfall was fairly heavy, as is the case in most hill districts. These phosphates are thus considered suitable for top-dressing hill pastures, provided they contain a high total phosphate, are very finely ground, and are applied at the rate of about 1,200 lbs. per acre.

Phosphorite beds in Russia in the light of recent investigations [trans. title], [D. N.] PRJANISCHNIKOW [PRIANISHNIKOV] (*Ztschr. Pflanzenernähr. u. Düngung, 2 (1923), No. 6, Wirtschaft.-Prakt., pp. 315–321; abs. in Biedermann's Zentbl., 53 (1924), No. 9, pp. 324–326*).—Data on the phosphate deposits of Russia are presented. These are based upon recent investigations, and indicate that the total supply of raw phosphates in European Russia is in the neighborhood of 5,568 million tons. This supply is grouped according to phosphoric acid content as 141 million tons containing over 24 per cent phosphoric acid, 1,707 million tons containing from 18 to 24 per cent phosphoric acid, and 3,720 million tons containing from 12 to 18 per cent phosphoric acid.

The most important deposits are on the upper reaches of the Kama River in the Government of Viatka. Other important deposits occur in the Governments of Moscow, Kaluga, Simbirsk, Penza, Tambov, and Saratov.

Potash: A newly found natural resource, G. E. MITCHELL (*Amer. Forests and Forest Life, 31 (1925), No. 375, pp. 157–159, 190, figs. 5*).—Attention is called especially to the need for further exploration with core drills to determine more definitely the location, extent, and character of the potash deposits of southwest Texas.

Effect of fertilizers and cropping on potassium supply of the soil (*Ohio Sta. Bul. 382 (1924), pp. 27, 28*).—Investigations of soils that have been limed and treated with fertilizers that do not supply potassium have shown that larger crop yields have appreciably reduced the natural supply of available potassium. This has been most noticeable in the case of the corn crop.

Sodium fertilization to sugar beets [trans. title], D. MEYER (*Ztschr. Pflanzenernähr. u. Düngung, 2 (1923), No. 9–10, Wirtschaft.-Prakt., pp. 446–453; abs. in Biedermann's Zentbl., 53 (1924), No. 9, pp. 327, 328*).—Field experiments on the fertilizing influence of rock salt on sugar beets when used with and without potash fertilization are briefly reported. The small increases in yield from the rock salt did not pay for its use.

Transformation of caustic lime into calcium carbonate in soil [trans. title], E. BLANCK and W. LOHMANN (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 2, Wiss., pp. 91–110, fig. 1; abs. in Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 1, pp. 72, 73*).—Studies on the transformation of calcium oxide into calcium carbonate in sandy soil and clay soil showed that this transformation is quantitative and requires a relatively long period of time. The speed of transformation is apparently a function chiefly of the soil moisture and is independent of the quantity of lime used. Frequent cultivation was found to favor the transformation.

Do acid soils need lime? (*Ohio Sta. Bul. 382 (1924), pp. 13–20, figs. 8*).—Studies of acid soils are briefly reported, indicating that treatment with limestone is the first essential. However, attention is drawn to the importance of supplementing liming by proper fertility treatment.

The effect of sulphur and gypsum on the fertility elements of Palouse silt loam, L. W. ERDMAN (*Jour. Agr. Research [U. S.], 30 (1925), No. 5, pp. 451–462, fig. 1*).—Studies conducted at the Washington Experiment Station are reported, which showed that the Palouse silt loam has a naturally high sulfur oxidizing power, and that uninoculated sulfur when added to this soil is as efficient as inoculated sulfur in producing sulfates.

Under the conditions of the experiments the gypsum and sulfur used as fertilizers were readily leached out during the winter months. To guard against unnecessary losses of these materials, it is considered advisable to apply them at a time when the crop has the greatest need for them. All of the sulfur treatments increased the availability of the native soil potassium, as evidenced by the increased amount of this element in the drainage water from the soils which were treated with sulfur. Gypsum increased the amount of soluble potassium under greenhouse conditions, but definite increases in soluble potassium were not obtained under field conditions.

Elemental sulfur, when oxidized in the soil under greenhouse conditions, increased the loss of calcium in the leachings. The results on calcium obtained under field conditions were too irregular to point to any conclusions. Magnesium compounds in the soil were but little affected by sulfur or gypsum. Both the sulfur and gypsum treatments had little effect upon nitrification in this soil.

The rôle of silica in counteracting magnesia-induced toxicity, W. H. MacIntire, W. M. Shaw, and J. B. Young (*Soil Sci., 19 (1925), No. 5, pp. 331–341, figs. 7*).—Studies conducted at the Tennessee Experiment Station on toxicity induced by magnesia and the buffering effect of silica are reported. Tobacco was used as an indicator.

Magnesium oxide at the rate of 8,000 lbs. per acre was found to be toxic to tobacco, especially during the early stages of growth. Silica at the rate of 8,000 lbs. per acre decreased this toxicity, and a still greater effect was produced by 32,000 lbs. The decreased toxicity was apparently caused by a chemical combination between the magnesia and silica. All of the added magnesia had changed to either the carbonate or silicate form after the harvesting of the second crop.

Tests of catalytic fertilizers [trans. title], E. Zacharewicz (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 44 (1923), No. 33, pp. 178–180*).—Tests of manganese sulfate, sublimed sulfur, and a so-called radioactive fertilizer on eggplants, tomatoes, and potatoes are briefly reported. Favorable results were obtained with all three materials. It is thought probable that these were due to a stimulation of beneficial soil organisms.

Native ferromanganese as a catalytic fertilizer [trans. title], C. Picado and E. Vicente (*Ann. Inst. Pasteur, 37 (1923), No. 10, pp. 891–899, figs. 7*).—Experiments are briefly reported in which native ferromanganese minerals in pulverized form were added to corn, potatoes, beans, oats, horse-radish, and carrots in amounts varying by geometric progression from 2 to 512 kg. per hectare (1.8 to 455.7 lbs. per acre). Increased yields were obtained with all the crops even with the smaller applications. In a few cases some of the larger applications seemed to be slightly toxic.

***Experiments with copper sulfate** [trans. title]*, A. Densch and [T.] Hunnius (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 6, Wiss., pp. 369–386*).—Experiments on the fertilizing influence of copper sulfate on hay and grain crops in different soils are reported.

Copper sulfate fertilization was found to increase yields, this influence being usually manifested in the grain yield. The straw yields were frequently decreased, notably in the second year. Staining the seeds before planting with a copper sulfate solution of from 0.1 to 0.25 per cent had about the same influence as fertilization with this material.

A greater chlorophyll content of the crops resulted from copper sulfate fertilization, this in turn causing a greater assimilation of organic matter. The assimilation of mineral nutrients was apparently not increased in proportion, however. The assimilation of iron by crops was especially depressed by copper, and this is taken to indicate the possibility that copper may replace iron in chlorophyll formation.

AGRICULTURAL BOTANY

Growth in trees and massive organs of plants (*Carnegie Inst. Wash. Pub. 350 (1924), pp. 116, pl. 1, figs. 28*).—Two sets of studies are included.

Dendrographic measurements, D. T. MacDougal.—The observations on growth described in this paper were made principally on plants growing in the open and under the full influence of their habitual environment. The results are given in considerable detail.

The growth record in trees, F. Shreve.—The annual formation of a hollow cone of woody tissue, enveloping the trunk and all its ramifications, is the most important exponent of the physiological activity of trees. The study

here recorded was undertaken to enlarge the knowledge of the growth record in trees, with particular reference to the Monterey pine (*Pinus radiata*), and with additional work on the redwood (*Sequoia sempervirens*).

"The collective results of this work confirm our knowledge of the dependence of growth on the entire constellation of environmental conditions, and indicate that the annual march of growth is not correlated with the march of individual conditions. Future investigations may make it possible to formulate a composite expression of the leading conditions, with which the march of growth would be in close correlation."

Plant growth and physical principles [trans. title], V. Crémieu (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 4, pp. 263–265*).—Grouping certain formerly known and newly noted physical facts regarding plant growth and its conditions and relations, the author concludes that the growth of plant stems is due to an action which is characteristic and interior to the initial cells; such action being discontinuous and exerting its influence according to the resultant of the fields which exist within the cell, without distinction between the influence of gravity and that of (rotational) inertia (centrifugal force, so-called).

Adaptation of plants to the length of the daily illumination period [trans. title], V. Lubimenko and O. Szegloff (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 26, pp. 1915–1918*).—The authors undertook researches to ascertain whether there probably exist in plants under conditions peculiar to various geographical latitudes, adaptations, as regards photosynthesis, to the local daily light periods. The plants employed were *Phaseolus vulgaris*, *Hordeum vulgare*, and *Sinapis alba*. The lot of each sort used as control was exposed during the full daily sunshine period (from 12 to 16 hours), from August 1 to September 20; the other lots on the same days during periods of 10, 8, 6, and 4 hours daily, the forenoon and afternoon hours extending equally each way from the noon point. At the end of the experiment all of the plants were subjected to rigid analysis, and the results are presented in tabular form, with discussion.

The length of the root was found to vary in a sense opposite to the variation in length of illumination period. Only the control in Hordeum and Sinapis developed a flower-bearing stem. The total number of leaves per plant attained the maximum in the plants exposed for 8 or 10 hours daily, as did also the total superficial area per leaf. Hordeum and Sinapis are regarded as long-exposure species in the sense of that term employed by Garner and Allard (E. S. R., 47, p. 225; 49, p. 326).

It is claimed that green plants show specific adaptation to the daily period of illumination, such adaptation being manifested not only in the general course of development but also in the relative development of the different plant organs and in the production of dry substance. Only one optimal daily illumination period was found for the development of dry matter in the several parts of the plant.

Light, the agent in photosynthesis, retards (at the same time) other chemical actions necessary to the utilization of carbohydrates. It is considered as very probable that the differences in natural illumination period at different latitudes cause, directly, the adaptation of plants to the duration of the corresponding daily period of illumination.

Physiological-ecological studies on the drought resistance of xerophytes [trans. title], N. A. Maximow (*Jahrb. Wiss. Bot., 62 (1923), No. 1, pp. 128–144*).—Among other conclusions drawn from this work, the author holds that

the most important factors of drought resistance must be sought among the internal physiological characters of the plants.

Utilization coefficients and growth rate in fungi [trans. title], C. KILLIAN (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 25, pp. 1828–1830*).—Having carried forward tests intended to show whether fungi other than *Aspergillus niger* behave as did this fungus in work reported by Terroine and Wurmser (E. S. R., 50, p. 428), the present author presents in tabular form the results obtained, with brief discussion.

No proportionality was shown to hold between the coefficient of utilization and the rapidity of growth (dry matter formed per hour); neither of these, therefore, can be safely taken as a criterion of the actual value of a nutrient. There exists between the various constituents of a nutritive solution a movable state of equilibrium which permits no adequate definition of its absolute value. Only the value of a solution as a whole can be reliably expressed. It is thought that the same facts hold in animal physiology.

The determination of conidia formation in Sterigmatocystis nigra [trans. title], M. MOLLIARD (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 26, pp. 1857–1859*).—The object of this note is to state precisely the way in which spore formation in *S. nigra* is related to the chemical composition of the nutritive medium, which, as formulated in the present case, is claimed to be superior in some respects to that of Raulin. The author concludes that conidia formation may be brought about in case of *S. nigra* by conditions which may be realized simultaneously, these being a deficiency in the content of phosphorus or of some element other than potassium, with a corresponding increase of potassium in the nutritive medium.

Starch in red algae [trans. title], G. MANGENOT (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 3, pp. 183–185*).—It is claimed to have been shown in the course of previous study (E. S. R., 44, p. 823) that considerable differences among starches exist, in particular between ordinary starch and that of certain Floridene (Rhodophyceae). A later and a much more complete study of numerous examples of two red algae confirms these conclusions and yields others the details of which make up most of the present article.

Studies in the effect of Röntgen rays upon the germination of Oryza sativa, H. KOMURO (*Bot. Mag.* [*Tokyo*], *38* (*1924*), *No. 445, pp. 1–20, figs. 4*).—Tests were carried out with two pure lines of *O. sativa* exposed to X-rays, and it is claimed that the germination of both steeped and air-dried rice seeds was accelerated by the irradiation under conditions and in ways which are detailed

Carbon dioxide and growth of lettuce (*Ohio Sta. Bul. 382* (*1924*), *p. 39*).—Preliminary experiments are said to have shown that the adding of a small amount of carbon dioxide in experimental chambers resulted in a 26 per cent increased yield of lettuce.

The supposed dextrin reserve of the monocotyledons [trans. title], H. COLIN and H. BELVAL (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 21, pp. 1493–1495*).—Citing claims which have been widely quoted, particularly those of Leclerc du Sablon (E. S. R., 10, p. 1007; 11, p. 216) regarding the presence and percentages of a dextrin reserve present in bulbous plants, employing chiefly in this connection *Hyacinthus orientalis*, the authors detail the results of their own studies, emphasizing the statement that in all the cases levulosans and not dextrins were concerned. No claim was sustained regarding the rôle of dextrins as a means of carbohydrate reserve and a source of starch. In hyacinth, dextrins do not exist in appreciable quantity along with starch.

Renewed growth in potato due to grafting [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 12, pp. 857, 858*).—The

author has, in work previously noted (E. S. R., 14, p. 656), set forth the fact that new vitality may be shown by shoots which have already passed into a state of decline, if they are grafted upon growing plants, even, in some cases, of different kinds. Having later pursued researches (E. S. R., 47, p. 28) related to those above referred to, and having still later tested the tubers obtained from the latter experiments, he details herein the results of these tests, which employed the potato variety Fluke as the graft material and tomato as the stock.

It is stated that the grafting of Fluke on tomato is a means of revivifying the potato variety for a time the duration of which remains to be experimentally determined, and also a means of aiding in the control of potato disease. This is also claimed to afford a means of obtaining (accidental) new varieties. It is thought probable that the results may be found to vary according to the kind of stocks and the potato varieties used.

Modifications of plants cultivated under glass [trans. title], L. Blum (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 16, pp. 1085–1087*).—The author has studied in certain plants the modifications which become apparent after culture under glass or in the open, and which are referable to different developments or arrangements in the tissues chosen. Winter and summer forms were employed of *Veronica officinalis*, *Sanicula europoea*, *Viola canina*, and *Taraxacum dens leonis*.

It is stated that plants grown in open air showed, in contrast to those kept under glass, a consolidation of the epidermis, the cells being spread out and strengthened in correspondence with a thinning of the subepidermal layer. Numerous short hairs are present. There is a reduction of stomata. The layers of palisade tissue are more numerous. The vascular bundles are better supplied with supporting elements. Woody vessels are reduced in number and caliber, but an increase occurs in the thickness of their walls and in the degree of their differentiation.

The vacuum as a means of prolonging germinability in seeds [trans. title], A. Guillaumin (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 24, pp. 1737–1739*).—It is thought that the use of dryness and reduction of air pressure, which have been found to prolong germinability in seeds, may have practical value in connection with the successful transportation of seeds ordinarily very short-lived.

The respiratory system of plants [trans. title], M. Popoff (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 9, pp. 594–596*).—The respiratory system of plants, herein compared with that of animals, is discussed as to the means and processes involved in circulation and exchange and as to the chemical constituents of the moving media.

The vacuome in pollen grains of the gymnosperms [trans. title], P. Dangeard (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 13, pp. 915–917, figs. 5*).—Employing the method of vital coloration, the author has carried out studies, which are here indicated, on pollen grains of *Taxus baccata*, *Cephalotaxus fortunei*, *Cupressus lawsonia*, and *Biota* sp., which pollen grains show essentially similar covering membranes for all of these species.

The vacuome of these pollen grains contains, as does that of the seeds, a substance in colloidal solution more or less thickened, which responds to "vital" colorants, this substance having selectively osmotic properties. The vacuoles may appear rounded or as a fine network. The substance contained in the vacuole shows a reaction either acid or slightly basic. A direct continuity is claimed to exist (as in the germination of seeds) between the vacuome of the pollen grain and that of the pollen tube.

The reddening of cherries [trans. title], F. OBATON (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 25, pp. 1824, 1825*).—It is claimed that the reddening of cherries depends upon temperature, and that light exerts in this connection no direct influence; also that the reddening of fruits is connected with oxygen fixation.

The morphological nature of the " head " in cauliflower [trans. title], H. COUPIN (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 17, pp. 1176–1178*).—The head in cauliflower is not formed (as has been claimed) by an inflorescence simply developed in size and thickness, nor has the author been able to demonstrate by means of various colorants either animal or plant parasites in connection with head formations. The formation appears to be a simple monstrosity, presenting certain particularities of heredity (all cauliflower seeds giving true cauliflower). The arrested development which hereditarily eventuates in a head is teratological in character and not a result of parasitism.

The persistence of characters produced by saltness [in growing plants] [trans. title], P. LESAGE (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 4, pp. 257–260*).—A certain persistence is noted of characters produced by growing *Lepidium sativum* in saline media during periods of different lengths.

The influence of hexamethylenetetramine and of formic aldehyde on the internal morphology and on the chemical activity in bean [trans. title], E. and G. NICOLAS (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 6, pp. 404–407*).—Development of the work previously noted (E. S. R., 53, p. 326) shows that hexamethylenetetramine and formic aldehyde, in low concentrations, act as nutrients when furnished to bean plants, producing an increase of total weight, of leaf surface, of wood differentiation, of lignification, and of starch formation. These matters and others are discussed.

Toxicity studies with dicyanodiamide on plants, F. E. ALLISON, J. J. SKINNER, and F. R. REID (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 5, pp. 419–429, pls. 2, figs. 3*).—On account of conflicting reports on the value of dicyanodiamide as a fertilizer, the authors conducted pot experiments with wheat and cowpeas in which the amounts of dicyanodiamide and nitrate of soda were varied. Two types of soil, Norfolk sandy loam and Chester loam, were used.

Marked differences were noted between the response of wheat and cowpea plants, wheat being able to tolerate much greater applications than cowpeas. The difference in injury led the authors to the conclusion that for one crop the material may be very toxic, even in small amounts, while for other plants it is nearly inert or indirectly toxic, because it prevents nitrification.

The relations of plant cells to aniline colorants [trans. title], R. SCHAEDE (*Jahrb. Wiss. Bot.*, *62* (*1923*), *No. 1, pp. 65–91, fig. 1*).—Among the data obtained from a study of cell reactions to colorants, it is stated that in experimentation with root hairs of frogbit (*Hydrocharis morsus ranae*) coloration of the plasma with Bismarck brown and gentian violet took place only when injury to the cell had occurred and its death was impending, thus furnishing a sure prognostic of death.

Observations on plant protoplasm necrobiosis by means of a new vital reagent [trans. title], P. BECQUEREL (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 9, pp. 601–603*).—The production, synthetically, is described of a colorant capable of showing by visible color change the passage of a protoplasmic membrane or cell from the living to the dead condition, this change being construed as essentially an irreversible colloidal transformation of the fundamental substance of the cytoplasm and the nucleoplasm.

Psilocybe as a fermenting agent in organic débris, C. THOM and E. C. LATHROP (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 7, pp. 625–628*).—In a study of spontaneous combustion of sugar cane bagasse, the authors isolated a species of Psilocybe that was capable of producing active fermentation in this product. Mycelia of the fungus were found to penetrate compact areas in bagasse where common molds were unable to develop. This development was extremely rapid and was accompanied by easily determinable visual changes in the fibrous mass. The fungus has been provisionally identified as *P. atomatoides*.

GENETICS

Genetics in plant and animal improvement, D. F. JONES (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1925, pp. VIII+568, figs. 229*).—Intended as an introduction to the study of genetics, this volume treats of the fundamental principles of heredity, which it illustrates by references to recent experimental results. Methods for plant improvement and for animal improvement are outlined.

The question of heredity [trans. title], R. FICK (*Abhandl. Preuss. Akad. Wiss., Phys. Math. Kl., 1924, No. 3, pp. 34, figs. 2*).—A brief account of the mode of inheritance of characters, dealing with the determiners of characters and their mode of transportation in the chromosomes.

A botanical study of the flax plant.—IV, The inheritance and interrelationship of the principal plant characters, A. G. DAVIN and G. O. SEARLE (*Jour. Textile Inst., 16* (*1925*), *No. 3, pp. T61–T82, pls. 4, figs. 2*).—Investigations of some of the major characters of the flax plant concerned with fiber yield are described, the discussion being largely based on extensive correlation data. Variations in flower color, length of the unbranched part of the stem, percentage of fiber as measured by area in the cross section through the center of the stem, and the relative earliness of flowering appeared to be all strongly inherited, and probably also the number of seeds in the capsule. Other characters which were studied and their interrelations investigated include the number of capsules and seeds, the thickness of the stem, the degree of tillering, the area of the cross section of the stem, the number of ultimate fibers and their size, and the number of fibers per square millimeter of the stem area.

Heredity in rabbits and guinea-pigs, W. E. CASTLE (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1925, vol. 1, pp. 419–458, figs. 24*).—A brief but comprehensive review of the inheritance of characters in rabbits and guinea pigs, including a selected bibliography of 84 references.

A note on the inheritance of egg-colour in the silkworm, C. PELLEW (*Jour. Genetics, 15* (*1925*), *No. 2, pp. 233–235*).—Due to the confusion over the inheritance of egg color in silkworms, the author summarizes the facts from the papers of K. Toyama[1] and Uda (E. S. R., 50, p. 531) as follows: "The three egg colors, blue, brown, and crimson, are all recessive to slate, and, in relation to that color, blue is determined by the mother, crimson by the factorial constitution of the embryo, and brown by the mother when she is homozygous, but mainly by the factorial constitution of the embryo when she is heterozygous."

Studies on papillary patterns of human fingers, K. BONNEVIE (*Jour Genetics, 15* (*1924*), *No. 1, pp. 111, pls. 4, figs. 60*).—This is the report of a statistical analysis of the fingerprints of 24,518 Norwegian criminals, with a more detailed study of the fingerprints of 200 individuals and 15 pairs of

[1] Jour. Genetics, 2 (1913), No. 4, pp. 351–405, pl. 1.

identical twins. The variations found and the method of classifying the types of fingerprints are discussed with reference to indications of hereditary differences. The mode of inheritance was not generally evident, but in most cases the operation of multiple factors was indicated.

Chromosome numbers in mammals, T. S. PAINTER (*Science, 61 (1925), No 1581, pp. 423, 424, figs. 3*).—The results of chromosome counts made recently by the author at the University of Texas have shown the diploid chromosome numbers in the rabbit to be 44, the armadillo 60, and the hedgehog 48.

The chromosome number of maize, T. A. KIESSELBACH and N. F. PETERSEN (*Genetics, 10 (1925), No. 1, pp. 80–85, pl. 1*).—Counts of the chromosomes found in the pollen mother cells of 11 varieties and 8 inbred strains of dent corn, 3 varieties of flint corn, and 1 each of pop, soft, and sweet corn, Chinese maize, annual teosinte, and sorghum, grown under normal field conditions at the Nebraska Experiment Station in 1924, showed all the forms studied to have 10 as the haploid number. The chromosomes of teosinte appeared very similar to those of corn.

"Since such great constancy was found in the number of chromosomes in widely different types of maize, it appears likely that the variability of this species has resulted from factor mutations rather than from irregularity in chromosome behavior during mitosis leading to change of number."

The anthesis of the sugar cane flower [trans. title], M. CALVINO (*Chaparra Agricola, 1 (1925), No. 10, pp. 1–9*).—Unlike other grasses, sugar cane is protogynous. Studies on several seedlings and varieties showed that meteorological conditions influence the opening of the flowers and dehiscence of anthers, dew appearing to be the prime limiting factor in dehiscence. The author considers that pollination may be best accomplished in the morning shortly before the natural dehiscence of the anthers. See also an earlier note (E. S. R., 45, p. 829).

The linkage of dark-eye and color in mice, J. A. DETLEFSEN (*Genetics, 10 (1925), No. 1, pp. 17–32*).—The author has summarized the data of other investigators from experiments which have been designed to show the amount of crossing-over between the pink-eyed and color factors in mice and has contributed new data on this subject.

Based on a total of 1,900 offspring produced in matings of heterozygotes for color and darkeye (Cd cD) and classified after the appearance of pelage, crossing-over was calculated at 29.98 per cent. New data obtained by back crossing heterozygous individuals with homozygous recessives showed crossover values in repulsion experiments of 8.82 ± 1.19 per cent for males and 17.30 ± 0.85 per cent for females. The former figure was based on 544 offspring and the latter on 2,000. In coupling experiments, crossing-over in males was found to be 5.70 ± 2.15 per cent and in females 9.57 ± 2.14 per cent. Both figures were based on 982 individals. The repulsion and coupling data were dependent on the classification of eye color at birth.

The results of other investigators, as well as the new data presented by the author, have consistently shown a lower male than female crossover value in coupling experiments, but in no case, even when the data are combined, is this difference significant. In repulsion experiments Dunn's results showed no significant difference between the crossover values of males and females, but from the new data this difference was 5.8 times its probable error.

The author points out that a selective elimination of the weaker (pink-eyed) classes would lower the male crossover value in coupling experiments. The opposite effect results in repulsion experiments. The problem of pooling the

data from coupling and repulsion experiments is discussed, as well as a method for calculating variability in crossover values based on a simple parental cross in coupling experiments or on a single crossover class in repulsion experiments.

Sex determination and sex differentiation (*Amer. Nat., 59 (1925), No. 661, pp. 115–189, figs. 36*).—Under this general heading are included the following papers presented at a symposium held at the Washington meeting of the American Association for the Advancement of Science:

Sex determination and sex differentiation in the higher plants, J. H. Schaffner (pp. 115–127).—The author has discussed the factors operative in the determination of sex in the higher plants, and presents results in which as high as 93 per cent of sex reversal has been produced in staminate hemp plants by changing the length of the day and modifying the soil. Further data are presented in which the effects of environment on sex are pointed out, from which it is concluded "that sex in organisms is primarily dependent on physiological states and that these states are subject to change and reversal through ecological factors."

Sex in relation to chromosomes and genes, C. B. Bridges (pp. 127–137).—The relation of the autosomes and sex chromosomes in the determination of sex in *Drosophila melanogaster* is discussed, and types of individuals obtained since the previous paper on this subject was published (E. S. R., 47, p. 172) are noted. Among the new females has been a type having the 4N chromosome number, which in sex characteristics is like a 2N and 3N and has the same sex index. Individuals with the haploid chromosome number have not yet appeared. Comparison is made with sex determination in the moths, *Lymantia dispar*, bees, and dioecious moss.

Sex and the parthenogenetic-bisexual cycle, A. F. Shull (pp. 138–154).—The author discusses the factors leading to parthenogenetic and bisexual reproduction in aphids, cladocera, and rotifers from which he concludes "that whatever introduces the sexual phase in the aphids, cladocera, and rotifers must be rather readily influenced by the environment." The sex differentiation is sharply defined and maintains complete irreversibility for a whole generation. The chromosome numbers of sexual and parthenogenetic females were found to be the same, but it is believed that differences in the physical or chemical constitution may occur, such as an increased viscosity in the parthenogenetic female. An increase in the viscosity of the oocytes of rotifers prior to the maturation division is noted.

Sex differentiation in the bullfrog (Rana catesbeiana), W. W. Swingle (pp. 154–176).—The author reports the results of an embryological and cytological study of gonad development in seven races of *R. catesbeiana* collected in different parts of the United States in which sex differentation occurs at widely different ages. In certain races called undifferentiated, sex determination is not possible until from 8 months to 2 years of age, while in others the sex differences are obvious much earlier. The undifferentiated races have been found to possess progonads which have both ovarian and testicular characteristics, but in which the appearance of the sex cords at an advanced age is immediately followed by degeneration of the progonad tissue with the development of a definitive testis from the residual cells. The nature of the underlying physiological process is, however, unknown. The progonads are suggested as an expression of a neutral stage.

Sex determination and sex differentiation in birds and mammals, C. R. Moore (pp. 177–189).—The present knowledge of sex differentiation in birds and mammals is briefly reviewed, based largely on the results of the removal or grafting of gonads of one sex on the other. In conclusion it is stated that sex determination occurs in the zygote and that sex-determinating factors

are sex-differentiating factors reinforced early in development by the production of hormones.

Sex-limited characters in birds and their bearing on Lamarckian theory, with new suggestions concerning the genetics and origin of hen-feathering, J. T. Cunningham (*Sci. Prog.* [*London*], *19* (*1925*), *No. 75*, *pp. 431–442*).—The author presents evidence in favor of the Lamarckian theory of evolution, with special reference to secondary sex characters, believing that they have developed by external stimulation.

Secondary sex characteristics and the interstitial gland, N. Goormaghtigh (*Endocrinology*, *8* (*1924*), *No. 6*, *pp. 757–761*).—This is a summary of papers presented at a symposium on the subject, held in conjunction with the nineteenth meeting of the Association of Anatomists at Strassburg, France, from April 14–17, 1924.

The differential death-rate of the sexes among animals, with a suggested explanation, S. W. Geiser (*Wash. Univ.* [*St. Louis*] *Studies*, *Sci. Ser.*, *12* (*1924*), *No. 1*, *pp. 73–96*).—The author presents evidence to indicate that in mammals the male death rate is greater than that of the females, while the reverse condition was found in birds and moths. This situation is linked up with the chromosome determination of sex and the fact that mutant species of Drosophila are frequently shorter lived than wild types.

It is concluded that the effects of mutations in one sex chromosome are masked in the homozygous sex but not in the heterozygous sex, which may thus tend to account for the existing differential sex mortality.

Single-ovum twins in the pig, G. L. Streeter (*Amer. Jour. Anat.*, *34* (*1924*), *No. 1*, *pp. 183–194*, *figs. 5*).—The author has described a case of single-ovum twins which were discovered at the Embryological Laboratory of the Carnegie Institute in a litter of long, threadlike chorions washed from the uterus of a sow. The twins appeared as two embryonic discs at opposite sides of the chorion. One was a little further developed than the other, but both were similar to their litter mates. Twinning at such an early age allows for very little environmental influence on the production of twins in this case.

The inheritance of sterility and of other defects induced by abnormal fertilization in the parasitic wasp, *Habrobracon juglandis* (Ashmead), A. R. Whiting (*Genetics*, *10* (*1925*), *No. 1*, *pp. 33–58*, *pl. 1*, *figs. 2*).—In this species, in which fertilized eggs commonly produce females and unfertilized eggs develop into males, it has been found that a small proportion of the fertilized eggs in crosses have developed into males. This occurrence was observed in crosses involving black-eyed males and orange-eyed females. These characters are sex linked, and black is dominant. The patroclinous males (black) were found to show a high percentage of morphological abnormalities, and the majority tested proved sterile. A few mosaics were found to be fully fertile, producing orange-eyed daughters which were normally fertile. A few black breeding patroclinous males have been partially fertile, the daughters of which are largely abnormal and mostly sterile. One black-eyed sterile male was produced by a black-eyed daughter of a patroclinous male.

Histological studies showed no defects of the internal genetalia of the patroclinous males or their black-eyed daughters. Hypothetical explanations are given of the sterility occurring in these individuals.

A clinical study of the effects of mammary gland substance upon uterine function, P. H. Charlton and E. Rickey (*Endocrinology*, *8* (*1924*), *No. 6*, *pp. 762–769*).—In studying the effects of mammary gland substances on the oestrus cycle, 79 women ranging in age from 15 to 33 years were given 2- to 8-grain doses three times daily of desiccated mammary glands of sheep at varying periods with reference to the menstrual period. The conditions at-

tending menstruation and the time between periods were variable with individuals, but the effects of the mammary hormone, if such exists, were negative and inconstant.

The effect of feeding mammary gland substance upon the oestrus cycle of the rat, P. H. CHARLTON and M. O. LEE (*Endocrinology, 8 (1924), No. 6, pp. 770–776*).—In studying the effect of the secretions of the mammary gland on the oestrus cycle at the Ohio State University, 21 female rats were observed as to their oestrus cycle by the daily examination of vaginal smears. After continuing the observations for 15 days, 11 of the rats were given daily for 24 days doses of 2 grains of desiccated mammary glands of cows in the last third of gestation. This was succeeded for 9 days with 4-grain doses. In no instance was there any effect of the experimental feeding on the length of the oestrus cycle, the average duration for the 11 animals being 5.36 days for the preliminary period, 5.19 days while the gland was being fed, and 5.04 days following the feeding. The controls averaged 5.3 days.

The effect of ovarian extracts upon the spontaneous contraction of the fallopian tube of the domestic pig with reference to the oestrous cycle, D. L. SECKINGER (*Amer. Jour. Physiol., 70 (1924), No. 3, pp. 538–549, figs. 15*).—In conducting this investigation, rings of the Fallopian tube muscle of sows were suspended in oxygenated Locke's solution and attached to the recording arm of a kymograph. Extracts in physiological salt solution of corpora lutea, large follicles, recently ruptured follicles, and the stroma of the ovary after pulverizing and drying were prepared and added to the muscle preparation.

The results showed that corpus luteum extracts tended to increase the strength but decrease the rate of the contractions of the interoestrus tube muscle. The same extracts tended to change the oestrus type of contraction to that typical of the inter-oestrus period. It also caused marked contractions of the vas deferens of rats. The activating substance was removed by acetone extractions but not by defatting with petroleum ether or by deproteinizing with lead acetate prior to extracting with the physiological salt solution. The corpus luteum substance showed little deterioration in its activity after boiling two hours. The extracts of the mature follicles, recently ruptured follicles, or ovarian stroma exerted practically no influence on the contractions of the Fallopian tube muscle.

The hormone of the ovarian follicle: Its localization and action in test animals and additional points bearing upon the internal secretion of the ovary, E. ALLEN, B. F. FRANCIS, L. L. ROBERTSON, C. E. COLGATE, C. G. JOHNSTON, E. A. DOISY, W. B KOUNTZ, and H. V. GIBSON (*Amer. Jour. Anat., 34 (1924), No. 1, pp. 133–181, figs. 10*).—A more complete account of the investigation noted from a preliminary report (E. S. R., 52, p. 130).

Histological changes in the testis of the guinea pig during scurvy and inanition, B. LINDSAY and G. MEDES (*Soc. Expt. Biol. and Med. Proc., 22 (1924), p. 177*).—In experiments at the University of Minnesota and Wellesley College diets deficient in vitamin C or supplying inadequate amounts of food were found, on histological examination, to retard the development of the testicles in young guinea pigs and to cause degeneration of the spermatozoa, spermatids, and spermatocytes in older animals. The interstitial tissue and Sertoli cells were unaffected.

The production of hidden hereditary factors without crossing by activating color genes in albinos of the Russian rabbit group [trans. title], W. SCHULTZ (*Ztschr. Induktive Abstam. u. Vererbungslehre, 35 (1924), No. 3–4, pp. 238–256*).—The author presents the results of experiments in which rabbits have had the hair plucked from certain parts of the body followed by exposure

to cold. The new developing hair in such cases has frequently been of a different color, corresponding to suppressed color factors carried by the individual, such as various colors carried by albinos.

FIELD CROPS

A study of sizes of plats, numbers of replications, and the frequency and methods of using check plats, in relation to accuracy in field experiments, R. SUMMERBY (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 140–150*).—In experiments at Cornell University Welcome oats were seeded in two series of 300 rows 1 ft. apart and 15 ft. long. Harvesting each row separately permitted grouping of adjacent rows into larger plats, i. e., 1 ft. by 15 ft., 2 by 15, 4 by 15, 8 by 15, 16 by 15, and 32 ft. by 15 ft.

Results obtained under the conditions of the experiment indicated that small plats are more accurate than large plats, within the limits of the sizes and shapes used. A steady and rapid increase in accuracy appears to accompany increase in number of replications, the most rapid gain in accuracy being had by increasing the number to 4. With 8 replications little difference is to be noted in the degree of accuracy between the different sizes of plats. The probable error probably can not be reduced with certainty to less than 2 per cent in comparative tests, even with as many as 16 replications.

The frequency and methods of using checks were also tested with each of several sizes of plats. The methods of obtaining the theoretically normal yield tested were (1) the average of the two closest checks, i. e., one on each side of the supposed test plats; (2) the average of the four closest checks, i. e., two on each side of the test plats; (3) the theoretical yield obtained by grading the yield from check to check progressively; and (4) a method applicable to replicated tests, the theoretical mean yield being obtained by calculation progressively from the mean of check plats on one side of a group of varieties to the mean of the check plats on the other side of the group.

Correction was not significant as measured by the standard of three times the probable error. In few cases was there uniformity in the several tests of each method. The effect of more or less frequent checks was not consistent, regardless of the method used. Although no method effectively reduced variability when measured in terms of the probable errors, no errors were introduced. Moreover, plus corrections occurred much oftener than negative corrections.

Experiments on the spacing of crops, J. A. PRESCOTT (*Sultan. Agr. Soc., Tech. Sect. Bul. 13 (1924), pp. 64, pl. 1, figs. 22*).—In the competition between the same kind of plants which controls the yield of field crops grown under different conditions, the volume of soil occupied by the roots may be considered as the principal variable factor. On this assumption the Mitscherlich expression (E. S. R., 44, p. 829) was found to hold for corn, cotton, and wheat under various conditions in the spacing tests described.

When yield per unit area is calculated on this basis a maximum is rapidly approached, so that above certain densities of planting the yield becomes constant for all practical purposes within the limits of experimental error, when the total weight of the crop is considered. When only grain yield is considered, the smaller plants may be less effective than the larger, so that the yield per plant becomes negligible although a certain volume of soil is still available. The crop seems so to affect nitrate production in the soil that less nutrients are available at the closest spacings. Where yield is built up over a period, as is possible with the flowering habit of cotton or the tillering of wheat, the earliness of the crop is also affected. Such conditions, except for

seasonal time limitations, permit a much greater range of spacing than with corn.

[Agronomic investigations at the Northern Great Plains Field Station, 1923], W. P. BAIRD, T. K. KILLAND, J. T. SARVIS, and J. C. THYSELL (*U. S. Dept. Agr. Bul. 1337 (1925), pp. 11, 12, 13–16*).—Supplementing the work of earlier years (E. S. R., 53, p. 132), these pages report the 1923 results of rotation and tillage experiments, including wheat, corn, oats, barley, and flax; variety trials with corn, potatoes, and forage crops; and spacing and selection tests with potatoes.

[Legumes in northern Idaho], G. R. McDOLE and J. H. CHRIST (*Idaho Sta. Bul. 136 (1925), pp. 11–18, 22, 23, fig. 1*).—Experiments with legumes at the Sandpoint Substation, applicable to cut-over lands, showed fall plowing to be preferable to spring plowing, with 5 or 6 in. the optimum depth, inoculation to be desirable, the optimum time of seeding to be in spring after the danger from heavy frosts is past, generally in April and early May, and suitable seeding rates per acre for red clover to be 10 to 12 lbs., alsike 6 to 8, alfalfa 8 to 12, sweet clover 12 to 15, vetch 30 to 60, and peas 90 to 120 lbs. Broadcasting gave better results than drilling on the lighter soils. The use of nurse crops proved unsatisfactory. Specific information is given on handling the crops mentioned and mixtures, with examples of rotations based on sweet clover and red clover.

Adapted crop varieties for Kansas, H. H. LAUDE and H. R. SUMNER (*Kans. Agr. Col. Ext. Bul. 51 (1925), pp. 23, figs. 10*).—Varieties of wheat, oats, corn, sorgo, grain sorghum, soy beans, alfalfa, barley, and sweet clover are recommended for Kansas conditions from the results of varietal experiments and cooperative trials.

[Field crops experiments in Louisiana], A. F. KIDDER ET AL. (*Louisiana Stas. Rpt. 1924, pp. 12, 13, 14, 15, 18, 19, 34, 38–42, 47, 48*).—The leading varieties in trials at Baton Rouge (E. S. R., 51, p. 830) included Patterson and McGehee oats; Hastings, Mosby, and Cocke Prolific corn; Ebony, Hamilton, Black Eyebrow, and Early Brown early soy beans, Otootan late soy beans for hay and Mammoth Yellow, Biloxi, and Otootan for seed; Cleveland (Coker), Cook 1346, Salsbury, and Cleveland 903 cotton; and Kobe lespedeza. Certified seed of Triumph potatoes from seven northwestern States were compared.

Exotic red clover strains had very little mildew, while native strains showed from 30 to 50 per cent infection. Seed from France and Chile made the most hay per acre. Ladino clover grew more rapidly than White Dutch clover and survived the first cutting considerably longer.

Boll studies with cotton gave indications of the importance of protecting boll setting while blooming is increasing to its maximum, and that weevil control after this maximum is reached is relatively less important so far as maturity of the crop is concerned. The rainfall recorded did not seem to affect boll setting injuriously. Plants spaced 8 to 12 in. apart averaged 20 or more bolls per row foot, whereas those spaced 20 to 30 in. apart produced only 11 bolls per row foot.

Tests of sugar cane seedlings, analyses of some of which are tabulated, were carried on at the Sugar Experiment Stations.

Investigations at the North Louisiana Station comprised fertilizer tests with cotton, with and without dusting for weevil control, variety trials with cotton and corn, and rotations.

April and May seedings gave the best results with rice at the Rice Experiment Station. While some increases accrued from certain commercial fertilizers, the results do not indicate profit from their use, whereas growing soy

beans in rotation with rice has maintained soil productivity and economical production. Rice yields after soy beans far exceeded those from commercial fertilizers. The Biloxi soy bean has proved its resistance to excessive rains and droughts.

[Field crops experiments at Williston, N. Dak., Substation, 1908–1924], A. C. Kuenning (*North Dakota Sta. Bul. 190 (1925), pp. 10–23, 27–32, fig 1*).—The data given in these pages supplement those recorded earlier (E. S. R., 48, pp. 224, 226), bringing up to date results of varietal trials with wheat, oats, barley, flax, corn, annual forage crops, and potatoes, rotations under irrigation, production trials with sugar beets, and flax-wheat mixtures (E. S. R., 51, p. 437).

In irrigation experiments in 1923 irrigation increased the average yields of varieties of common wheat 20 per cent, durum wheat 9, oats 67.9, dent corn 100, and barley 31.6 per cent, and irrigated sunflowers made from three to four times as much tonnage as those on dry land. With a number of crops two applications of irrigation water were greatly superior to one application. The costs and economy of crops grown in a demonstration of irrigation farming are recorded for 1923 and 1924.

[Field crops experiments in Ohio] (*Ohio Sta. Bul. 382 (1924), pp. 20–26, 40, 41*).—The behavior of several crops in rotations are described as heretofore (E. S. R., 51, p. 433). When seeded in wheat in March and allowed to freeze in, alfalfa and sweet clover do not appear to do as well as red clover. Sweet clover considerably outyielded red clover in 2-year rotations where the legume followed wheat. Red clover seeded in wheat yielded slightly more than that seeded in oats. Alfalfa seeded in oats made nearly 2.75 times as much hay as alfalfa seeded in corn at the last cultivation.

Tested and untested seed corn planted thick and thinned later to three stalks per hill averaged 62.7 and 61.9 bu. per acre, respectively, and planted three kernels per hill, 56.6 and 54.6 bu. Even with corn of 100 per cent germination the loss of stand from various causes averaged 16.45 per cent for the three kernels of tested seed. Dropping four kernels of 100 per cent germination, together with a small amount of thinning, is indicated for a stand of three plants at harvest. The tendency in thinning corn to pull out the small and weak plants may account in part for the increase of thinned corn over that unthinned. An average gain of 7.9 per cent in yield of shelled corn was realized as the result of crossing corn varieties.

The winter behavior of kudzu at the station and in the State disclosed that it is nonhardy in Ohio as far south as Columbus and probably to the Ohio River. Even when only partly killed in somewhat milder climates it has not made growth enough to justify its culture for forage.

The relation of the yield of wheat following potatoes and other crops to nitrates has been noted earlier (E. S. R., 52, p. 430).

Ohio certified seed potatoes have compared favorably with certified seed from the north. The importance of using only certified seed is emphasized. In experiments concerned with temperature in relation to the growth of potatoes (E. S. R., 51, p. 340), tuber growth in the greenhouse was very slow above 70° F. About 64° appeared to be the optimum temperature for growth. Even though moisture was abundant, tuber growth practically ceased during periods of high temperatures. Some varieties of potatoes, particularly the Early Ohio, are very susceptible to high temperatures, while others, such as Russet Rural, can endure such periods without appreciable harm.

[Field crops work on the Canadian experimental farms in 1923] (*Canada Expt. Farms, Rpts. Supts. 1923, Agassiz (B. C.) Sta., pp. 17–19, 20, 27–32, 37, 38; Invermere (B. C.) Sta., pp. 5, 6, 7–10, 12–15, figs. 3; Sidney*

(B. C.) Sta., pp. 7–9, 20, 21, 29–36, fig. 1; Lethbridge (Alta.) Sta., pp. 16–27, 29, 31–35, fig. 1; Indian Head (Sask.) Sta., pp. 11–13, 16, 17, 18, 23–28; Rosthern (Sask.) Sta., pp. 16, 17, 21–23, 26–28, 34–45, fig. 1; Scott (Sask.) Sta., pp. 10–13, 16–28, 34, 35, 40–52, figs. 4; Swift Current (Sask.) Sta., pp. 8–12, 19–27, figs. 2; Brandon (Man.) Sta., pp. 17–39, 41–56, 72–90; Morden (Man.) Sta., pp. 9–13, 32, 33, 34, 35–40, 49, figs. 3; Kapuskasing (Ont.) Sta., pp. 16–19, 22–27, 40–55; Cap Rouge (Que.) Sta., pp. 12–16, 32, 33, 34–53; La Ferme (Que.) Sta., pp. 17–20, 23–38, 53–60, 64, 65; Lennoxville (Que.) Sta., pp. 14–22, 23, 34–44, 51, 52, fig. 1; Ste. Anne de la Pocatière (Que.) Sta., pp. 14–16, 21, 22; Fredericton (N. B.) Sta., pp. 37–55, 67, 68; Charlottetown (P. E. I.) Sta., pp. 9–12, 15, 16, 20, 22–25, 35; Nappan (N. S.) Farm, pp. 19, 20, 21, 22, 27, 28, 29, 31–41, fig. 1).—Experiments reported on in continuation of previous work (E. S. R., 49, p. 733; 50, p. 533) included variety tests of winter and spring common wheat, durum wheat, oats, barley, winter and spring rye, millet, buckwheat, flax for seed and fiber, hemp, corn for grain, corn and sunflowers for silage, oats and peas for hay, field beans, field peas, soy beans, red clover, white clover, sweet clover, alfalfa, western rye grass, timothy, potatoes, mangels, swedes, field carrots, sugar beets, tobacco, and miscellaneous grasses; rotations involving many of the crops named; comparisons of silage crops, of nurse crops for alfalfa, sweet clover, and grasses, and of annual crops and mixtures for hay; studies of pastures and the persistence of agrictultural grasses; seeding trials with corn, wheat, oats, winter rye, sunflowers, flax, field beans, alfalfa, clover, annual and biennial sweet clover, western rye grass, timothy, potatoes, turnips, and silage crops; cutting tests with wheat, annual sweet clover, oats, and sunflowers; fertilizer trials with corn, wheat, oats, potatoes, and mangels; studies of the influence of windbreaks, spraying, selection, type, and seed treatment on the yields of potatoes; seed production trials with red clover, alsike, wild white clover, sweet clover, timothy, and turnips; cooking tests with field peas grown on different soils; legume inoculation experiments; comparisons of experimental methods; and cost of production studies.

The cultural investigations dealt with the effect on wheat and oats yields of depth of plowing, treatment of summer fallow and of stubble, and pastured v. cultivated summer fallow; cereals in cultivated rows; effects of cultural treatment on rust on cereals; effects of previous crops on seedings of grass and clover; methods of breaking alfalfa and western rye grass sod for winter wheat; value of barnyard manure applied on different cultural treatments to affect wheat, oats, and barley; soil packing; cereals as substitutes for summer fallow; and miscellaneous cultural tests with corn, beans, alfalfa, clovers, potatoes, sunflowers, and root crops. As in the previous work most of the tests at Lethbridge were carried on both under irrigation and on dry land.

Empire Textile Conference *(Manchester: Textile Inst., 1924, pp. 267+100, figs. 102).*—This is the official report of the proceedings of the conference held at the British Empire Exhibition at Wembly, London, June 10–12, 1924.

Among the papers of agronomic interest presented were the following: The Part Played by Our Empire in the Production of Raw Cotton, by W. H. Himbury; The Present Position of Textile Industries in India and Trade with Britain, by K. S. Rao; Research in Relation to the Cotton Industry, by A. W. Crossley; Research in Relation to the Linen Industry, by J. V. Eyre; "Futures" Contract, by A. B. Muir; The British Empire as a Producer of the Flax and Hemp Group of Fibres, by A. Wigglesworth; Flax and Its Products, by F. Bradbury; and Some Aspects of Linen Weaving, Ancient and Modern, by F. Anderson.

At a joint meeting of the Faraday Society and the Textile Institute the following[3] were given: The Physical Properties of Textile Fibres in Relation to Technical Processes and to General Colloid Theory, by S. A. Shorter; The Lustre produced in Cotton by Mercerisation, by T. Barratt; Some Structural Characters of the Flax Fibre, by C. R. Nodder; The Fibre Balance, by T. Barratt; The Action of Light on Textiles, by G. Barr; A Review of Work on the Absorption and Desorption of Moisture by Textile Materials, by A. R. Urquhart and A. M. Williams; and The Function of Water in the Wet Spinning of Flax, by W. H. Gibson.

[Field crops work of the Agricultural Research Institute, Pusa, 1923–24], A. R. KHAN, J. N. MUKERJI, and W. SAYER (*Agr. Research Inst., Pusa, Sci. Rpts., 1923–24, pp. 12–16, 25, 26, 27, 64–66, 129–141, pl. 1*).—The progress of agronomic experiments is reviewed as heretofore (E. S. R., 51, p. 36). Comment is made on the merits and behavior of Coimbatore seedlings Nos. 210, 213, 214, and other promising sugar cane varieties being developed by the Sugar Bureau.

Rack curing was more effective than ground curing in reducing the volatile nicotine in tobacco. Results during several years indicated that irrigation up to 2 in. does not influence the nitrogen content of wheat. Application of sodium nitrate at any time up to 12 weeks after seeding resulted in an increase of nitrogen in the grain.

Experiments relating to the time of cutting alfalfa, S. C. SALMON, C. O. SWANSON, and C. W. MCCAMPBELL (*Kansas Sta. Tech. Bul. 15 (1925), pp. 3–50, figs. 3*).—Cutting experiments with alfalfa (E. S. R., 52, p. 433) were carried on at the station between 1914 and 1923, inclusive.

Cutting in the bud stage markedly decreased the vigor of growth, the stand, and the yield of alfalfa hay and permitted the encroachment of grasses, the effect being clearly apparent the second year of the experiment. Cutting when the plants reach the tenth-bloom stage had similar effects, but these were not apparent until much later. Permitting plants to reach full bloom before cutting maintained their vigor and stand very satisfactorily throughout the experiment. While leaf spot caused more damage than in plats cut more often, cutting in full bloom produced the highest total hay yields and the highest yields of pure alfalfa hay. Delaying cutting until the seed stage reduced the yield but not the stand or apparent vigor of the plants. The seed stage and full-bloom plats were most successful in maintaining the stand of alfalfa and excluding grasses. No injury to the alfalfa plants was apparent as a result of cutting off the new shoots.

A considerable decrease in the number of leaves harvested was noted as cuttings became fewer, although the proportion of leaves in any season tended to be greater for the later cuttings than for the earlier. The leaves lost in harvesting and caring for the crop varied from 2.3 to over 34 per cent, constituting from 1.2 to 17.4 per cent of the weight of the entire crop. No definite correlation was evident between loss of leaves and time of cutting.

Analyses of hay from different cutting stages showed that the percentage of ash and protein decreased quite markedly as cutting was delayed, crude fiber was least for the bud stage and increased with delay in cutting, and ether extract was practically constant for all stages. The method of curing seemed to markedly affect the percentage of pure protein as compared with the total or crude protein, explainable on the assumption that the plant cells retain vitality for some time when the hay is shade cured, in which case the proteins are broken down by proteolytic enzymes. While the proportion of the

[3] Reprinted from Faraday Soc. Trans., 20 (1924), No. 2, pp. 223–324, figs. 37.

fertility elements removed from the soil by alfalfa varied somewhat, according to the stage of cutting, the differences were not enough to influence the time of cutting.

Feeding tests during three years demonstrated that the feeding value of alfalfa hay decreases materially with delay in cutting, the best hay for feeding beef steers being that cut in the bud stage and the poorest that allowed to reach the seed stage. To produce a pound of gain with the poorest hay required nearly 2.5 times the amount with the best hay.

Results to date suggest the possibility of cutting the first crop early, i. e., when in tenth bloom or in the bud stage, and to delay successive cuttings in the same season until the crop approximates full bloom.

Broom corn in Oklahoma, G. C. Gibbons (*Okla. Agr. Col. Ext. Circ. 215 [1925], pp. 28, figs 8*).—Practical information is given concerning the adaptation of broomcorn varieties, cultural and field methods, harvesting and curing practices, and marketing the crop. See also previous notes (E. S. R., 43, p. 232; 47, p. 132).

Cotton growing within the British Empire, L. G. Killby (*Empire Cotton Growing Rev., 1 (1924), Nos. 3, pp. 161–177; 4, pp. 261–280*).—Recent activities of the Empire Cotton Growing Corporation are discussed, with brief reviews of the present status and future prospects of the cotton growing industry in the dominions and dependencies of the British Empire.

Report of the Federal Trade Commission on the Empire Cotton Growing Corporation, V. W. Van Fleet et al. (*U. S. Senate, 68. Cong., 2. Sess., Doc. 226 (1925), pp. VI+30, fig 1*).—A report by the Federal Trade Commission regarding the development, methods, and activities of the Empire Cotton Growing Corporation.

Studies on some stalk characters of the potato [trans. title], E. Schaefer (*Jour. Landw., 72 (1924), No. 3, pp. 163–195, fig 1*).—The characters of the aerial portion of the potato plant were studied in 94 varieties at Göttingen in efforts to obtain accurate descriptions. Typical descriptions of Blücher, Deodara, Magdeburger Blaue, and Model are included.

Significant correlations were obtained between stalk height and stem length $r=+0.800\pm0.040$, stalk height and stem inclination $+0.520\pm0.086$, stem length and stem frequency $+0.582\pm0.073$, stem length and leaf length $+0.409\pm0.104$, stem length and stem strength $+0.481\pm0.086$, leaf length and leaf frequency $+0.403\pm0.102$, leaf length and feather (major) leaflet size $+0.753\pm0.054$, leaf length and feather leaflet interval $+0.823\pm0.040$, leaf length and feather leaflet frequency $+0.471\pm0.097$, feather leaflet size and feather leaflet interval $+0.474\pm0.096$, feather leaflet size and stem strength $+0.563\pm0.073$, stalk length and tuber weight $+0.427\pm0.093$, stalk length and tuber frequency $+0.606\pm0.072$, stalk number and tuber weight $+0.462\pm0.088$, stalk number and tuber frequency $+0.487\pm0.095$, feather leaflet size and tuber weight $+0.396\pm0.094$, feather leaflet size and tuber frequency $+0.500\pm0.085$, vigor and stem length $+0.574\pm0.076$, vigor and feather leaflet size $+0.489\pm0.085$, vigor and tuber number $+0.411\pm0.098$, and starch content and vegetation period $r=+0.478\pm0.086$.

Potato production in California, J. T. Rosa (*California Sta. Circ. 287 (1925), pp. 44, figs. 16*).—The status of potato production in California is discussed, potato growing districts and prominent varieties are described, factors affecting seed quality and cultural methods and field practices are outlined, and the characteristics and behavior of important potato diseases and insects are set forth, with control methods.

Preservation of washed and unwashed sugar beets [trans. title], E. Saillard (*Com. Cent. Fabric. Sucre France, Circ. Hebd., 37 (1925), No. 1878, Sup., pp. 2–4*).—Sugar beets washed soon after lifting lost more sugar during 37 days'

storage in piles than unwashed beets. Beets were dead after about 8 days' submergence in the Marne. There was a large increase in acidity at the expense of the sugar.

Windrowing of sugar cane, J. N. MUKERJI (*Agr. Research Inst., Pusa, Sci. Rpts., 1923–24, pp. 20–22*).—In further studies by P. B. Sanyal (E. S. R., 51, p. 38), the ends and either the nodes or internodes of lots of sugar cane that had been windrowed in shade for 14 and for 33 days were coated with wax, the lots immersed in water for 4 and 16 hours, respectively, and the composition of juice and increase in weight determined.

When the nodes were exposed to water more was absorbed, and the canes showed greater deterioration than when the internodes only were exposed. The longer the canes were immersed the greater were the absorption of water and the deterioration. The results supported the earlier conclusion that windrowed canes deteriorate on the incidence of rain, owing to the quick passage of water through the nodes of somewhat dried canes, which causes a translocation of the inverting enzymes from the nodes into the internodes and thus induces deterioration.

The sunflower as a silage crop, W. L. GAINES and W. B. NEVENS (*Illinois Sta. Bul. 268 (1925), pp. 407–455, figs. 29*).—Information on the yield and composition of sunflowers grown in 1921 was obtained from samples collected in the field at eight growth stages and from the crop as ensiled at three stages of growth. Previous investigations dealing with the composition or yield of sunflowers and with other crops at different growth stages are reviewed.

Data from the field samples were analyzed mathematically (following Robertson), using the equation, $\log \frac{x}{A-x}=K\ (t-t_1)$, in which x is the growth accomplished at any time, t, and A, K, and t_1 are constants. Each of the seed constituents except nitrogen-free extract exhibits the reverse curve generally characteristic of growth in animals and annual plants. In the stalk, crude fiber and aluminum only exhibit the same trend, the other constituents undergoing marked depletion concurrently with seed development. In the stalk of both sunflower and corn, growth in crude fiber is interpreted as a two-cycle phenomenon. The sunflower is slow growing in the first or vegetative cycle and corn is quick growing, whereas the reverse is true in the second or reproductive cycle. The specific growth-capacity constants (A/K) of the two crops indicate comparatively that the sunflower is inherently a stalk and crude-fiber crop, while corn exhibits high development of the reproductive function, being inherently a grain crop. It seems desirable to ensile sunflowers at a much earlier growth stage than corn.

Sunflowers produced 50 per cent more dry matter per acre than neighboring fields of silage corn, and the yields of ash, crude fiber, and crude fat in the sunflowers greatly exceeded the yields of these substances in corn. Corn, however, excelled in production of nitrogen-free extract.

The early death and withering of the lower sunflower leaves seems responsible for loss of nutrients, although nutrients from these leaves may have been translocated to other portions of the plant.

Results of digestibility studies conducted with the silage produced (E. S. R., 52, p. 79), when applied to the field data, indicate no marked increase in acre yield of digestible nutrients after 87 days from planting.

The sunflower crop removed large amounts of fertility elements from the soil, the total ash amounting to 900 lbs. per acre. Elements present in largest amount in the crop were, in the order of magnitude, potassium, calcium, nitrogen, magnesium, sulfur, and phosphorus. Aluminum and iron were present

in samples of both seed and stalk in appreciable amounts. The seeds were very rich in potassium and nitrogen, although they contained less than 6 per cent of the total ash of the crop. The relative proportions of the ash elements in the seed differed from those in the total crop. Marked reductions in the total ash in the crop occurred toward the close of the season. In contrast to marked changes in proportions of the organic constituents during growth, the changes were much less in the relative proportions of the ash constituents studied, excepting aluminum.

Studies of the effect of time of planting showed very pronounced decreases in yield due to late planting, and minor effects upon the composition of the crop. Spacing tests were inconclusive.

Sweet potato production in California, J. T. Rosa (*California Sta. Circ. 285 (1925), pp. 29, figs. 15*).—Available information applicable to sweet potato culture under California conditions deals with the status of the crop in the State; the soil, climatic and cultural requirements; methods of harvesting, packing, and storing; varieties; and diseases. A program for disease control is outlined.

How to grow and market high-protein wheat, L. E. Call, R. M. Green, and C. O. Swanson (*Kansas Sta. Circ. 114 (1925), pp. 21, figs. 2*).—The relation of protein quality to bread making, the protein content and market value, and the factors affecting the protein content of wheat (E. S. R., 52, p. 439) are discussed, and methods are outlined by which the farmer may increase the protein content of his wheat and market such wheat to advantage.

High-protein wheat, usually recognizable by the hard vitreous texture and the dark deep red color of the grains, may be produced by growing wheat of the Turkey type in almost any section of Kansas, if soil and climatic conditions are favorable. A low rainfall, reasonably high temperatures, and a short ripening period favor the production of this wheat. Such climatic conditions occur oftenest in central and western, and especially southwestern, Kansas. Sandy soils tend to give wheat low in protein, while heavier soils, the silt and clay loams, often produce high-protein wheat, especially when well supplied with nitrogen. The protein content of wheat may be increased by early plowing, thorough seed-bed preparation, and by rotating alfalfa and other legumes with wheat.

Experiments with wheat at the Dominion Experimental Farm, Brandon: A summary, 1889–1923, W. C. McKillican (*Canada Dept. Agr. Bul. 42, n. ser. (1924), pp. [1]+55, figs. 12*).—Investigations with wheat carried on at Brandon, Manitoba, during the period 1889–1923 and summarized in this publication were concerned with varietal trials with common spring, durum, and winter wheat; the seed value of frozen, hand-selected, home-grown, and the commercial grades of seed wheat; smut prevention; date, rate, and depth of seeding; summer fallow cultural tests and substitutes; treatment of stubble land and sod land, seed bed preparation, drill types, cultural treatment to control rust, and time of cutting; barnyard manure, green manure, and commercial fertilizers; rotations; and cost of producing wheat on summer fallow and on stubble land.

Milling and baking quality of western Canada wheat, A. W. Alcock (*Northwest. Miller, 141 (1925), No. 12, pp. 1154, 1181, 1182, figs. 2*).—The average protein content of wheat grown in western Canada from 1920 to 1924 is discussed, with comment on yield of flour and on flour quality as affected by variety, region, and climate.

Baking quality of wheat varieties grown in different parts of the State (*Ohio Sta. Bul. 382 (1924), pp. 26, 27*).—According to milling and baking tests,

the pure line selections of Trumbull, Portage, Fulhio, and Gladden winter wheat grown on the Montgomery and Clermont County Experiment Farms made the lowest loaf volume and contained the least nitrogen and gluten; grown on the Paulding County Farm they gave the largest loaf volume and the highest nitrogen and gluten contents; and when grown on experiment farms in Wayne, Meigs, and Cuyahoga Counties they produced a good quality of flour usable for general baking purposes.

Tests with wheat contaminated from containers used for sweet clover seed or directly from an admixture of sweet clover seed showed that the odor had penetrated the whole wheat berry. The bran when removed smelled very strong, and the flour was worthless for baking purposes. The bread had both the odor and a very pronounced taste.

Commercial agricultural seeds, 1924, L. M. Baker (*Maine Sta. Off. Insp. 114 (1924), pp. 69–83*).—The purity, germination, and weed seed content are tabulated for 139 official samples of agricultural seed collected in 1924.

Seed testing in Russia (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 4, pp. 798–809, figs. 2*).—The scope of the work of the Leningrad Station and other stations in northern Russia is summarized by B. Issatchenko, and the program and some of the laboratory methods of the Kharkov (Ukraine) Station are discussed by N. Kuleshoff.

HORTICULTURE

[Horticultural investigations at the Ohio Station] (*Ohio Sta. Bul. 382 (1924), pp. 37–39, 42, 43, fig. 1*).—Data are reported upon the amount of spray material required and the cost of spraying apple trees of various sizes. A total of 50 gal. of material was required for six applications upon trees averaging 27.3 ft. in diameter and 21.9 ft. in height and 25.5 gal. on trees averaging 17.9 ft. in diameter and 14.6 ft. in height.

Records taken upon the weight of fruit produced from each bud along the fruiting canes of grapes showed a maximum production between the third and the eighth bud. The amount of fruit borne beyond the eighth bud and the position of the fruit clusters on the shoots were dependent, apparently, upon the variety. Moderately vegetative canes were found most productive.

Pruning tended to increase the early yield of Bonny Best tomato plants, the total production for 20 plants at the end of the first four weeks being, respectively, 17.7, 15.5, 14.9, and 10.3 lbs. for 1-, 2-, and 3-stem plants and the unpruned lot. Despite greater susceptibility to leaf spot, which caused severe injury to unpruned plants, these outyielded the pruned plants in total production of ripe fruit. Pruning increased and helped to maintain the size of tomato fruits throughout the season.

Ringing investigations with the apple indicated the advisability of treating only one or two of the larger limbs in one season so as not to interfere seriously with the downward movement of food materials. Ringing was usually followed by an abundant formation of fruit buds in the same season, and where the tree was strong and well supplied with nitrogen these buds were capable of producing a fair set of fruit.

Several promising apples were found in an orchard comprising seedlings sent in from various parts of the State.

Horticultural investigations [at the Northern Great Plains Field Station in 1923], W. P. Baird and T. K. Killand (*U. S. Dept. Agr. Bul. 1337 (1925), pp. 8–11, 12*).—Supplementing a previously noted report (E. S. R., 53, p. 140) which covered the earlier work of the station, herein are briefly presented the

results of work in 1923, which consisted for the greater part of varietal and cultural tests. The plum appeared to be a better stock for Compass cherries than the sand cherry. A large amount of seed was obtained in the controlled fruit breeding operations in the greenhouse. Work in improving tomatoes and sweet corn by selection was actively pursued.

[Fruit variety testing in Wyoming], J. M. STEINBRECH (*Wyo. State Bd. Hort. Pubs., 3 (1924), No. 2, pp. 31-50, figs. 12*).—A presentation of hardiness records and brief descriptive notes upon fruits growing at the Lander Experimental Fruit Farm, where, despite the severity of the winters (elevation 5,900 ft.), numerous apples, crab apples, pears, plums, and cherries were found capable of surviving and bearing good crops of fruit.

Orchard cover crops, F. C. BRADFORD (*Michigan Sta. Circ. 69 (1925), pp. 4*).—In a concise manner, information is offered concerning the function and value of cover crops in the orchard. Oats sown about August 1 are deemed the most satisfactory of several crops for meeting the requirements of Michigan orchards, since they make their rapid growth in late autumn, at the time the trees should be maturing their new growth preparatory for the winter season.

Variation in size and form of Pyrus serotina, A. KIKUCHI (*Bot. Gaz., 79 (1925), No. 4, pp. 412-426, fig 1*).—Working with the Ben Davis apple in Japan, the author found that in fruit taken from a single tree there is a distinct tendency for those fruits produced from the terminal buds of long 1-year-old shoots to be more elongated than fruits produced on the spurs. Furthermore, it was noted that when long shoots were divided into two groups on the basis of length, those shoots more than 1 ft. in length bore the longer fruits. An examination of Ben Davis apples grown in various localities showed a correlation between high summer temperatures and oblateness.

Measurements taken on Chojuro pears harvested from the various plats of a fertilizer test at the Kanagawa Agricultural Experiment Station indicated that the only significant influence which fertilizers have on the shape of the fruit is indirect, through their influence on the date of ripening, the early maturing fruits being usually flatter in shape. A study of the fruit of a single Chojuro pear tree revealed no significant correlation between the form and the size of fruits. The form of the fruits was affected by the length of, and the average temperature during, the growing season, but no relationship was found between monthly rainfall and variation in form. The maximum rate of growth per day for the Chojuro pear occurred approximately 100 days from the time of full bloom.

Bush-fruits, F. W. CARD (*New York: Macmillan Co., 1925, new and rev. ed., pp. XIII+411, pls. 16, figs. 58*).—This revised edition differs in particular from earlier presentations (E. S. R., 37, p. 544) in the omission of botanical accounts.

[Strawberry tests at Hammond, La.], B. SZYMONIAK (*Louisiana Stas. Rpt. 1924, pp. 50, 51*).—In further work (E. S. R., 51, p. 841) with the strawberry, the highest yields were obtained on the plat fertilized with 360 lbs. of acid phosphate, 120 lbs. of nitrate of soda, and 45 lbs. of sulfate of potash per acre. Of 10 varieties tested, the Nick Ohmer was not only the earliest but also the most productive.

The importance of sex in the strawberry, G. M. DARROW (*Jour. Heredity, 16 (1925), No. 6, pp. 193-204, pl. 1, figs. 7*).—Following a brief review of the history and development of knowledge concerning sex in the strawberry, the author presents data secured in 1924 at three locations in Maryland. Remarkable differences were observed in the percentages of failure of flowers to set in perfect-flowered varieties. For example, at Salisbury, records taken upon 23 varieties show a variation of from 89 per cent of failure in the Big

Wonder variety to 2 per cent in the Lupton. At Glen Dale the range of failure for 8 varieties was from 45 per cent in Judith to 17 per cent in Joe and Klondike, and at College Park the range in 8 varieties was from 75 per cent in Burrill to 12 per cent in Klondike.

That the place of growing had an effect upon sterility was indicated in percentages of failure of 23, 17, and 28 for the Joe variety at Salisbury, Glen Dale, and College Park, respectively. In Klondike, on the other hand, the variability in sterility was only slight for the three places, the figures being 14, 17, and 12 per cent, respectively. That environmental factors such as day length, temperature, etc., have considerable effect on sex expression in the strawberry was shown in records taken upon 702 blossoms on 137 crowns of greenhouse-grown Howard 17 plants, less than 5 per cent of the blossoms being perfect. That this condition is also present in the field was shown in records taken at Glen Dale, where a high proportion of flowers carrying abortive stamens were found in several varieties, including Maryland, Progressive, Campbell, and Missionary. At Salisbury 15 varieties were found to have some flowers with abortive stamens and 21 varieties to bear flowers all of which possessed some well-developed stamens.

Phylloxera resistant vineyards, L. O. BONNET (*California Sta. Circ. 288 (1925), pp. 24, figs. 14*).—Herein is presented general information concerning phylloxera resistance in grapevines, pointing out the relative resistance of various species and selected stocks, designating satisfactory combinations of stock and scion, and discussing grafting technique, methods of handling and planting grafts, etc.

Some methods of asexual propagation of the avocado, L. G. GONZALEZ (*Philippine Agr., 13 (1925), No. 10, pp. 423–440*).—A discussion of the technique utilized and the success attained in propagating the avocado by various forms of grafting and budding, including shield budding and bark and cleft grafting.

In selecting buds for shield budding little difference was observed whether buds were taken from young, medium-ripe, or mature branches, but notable differences were found in the condition of the bud itself, plump, well-rounded buds giving the best results. Partial shade was conducive to success in bark grafting, and sphagnum moss proved the best medium for protecting the scions. In cleft grafting operations scions taken from medium-ripe wood proved superior to those from young or mature branches. As in the case of the bark graft, sphagnum moss proved the most suitable protective medium.

Some botanical problems of cacao, S. C. HARLAND (*Agr. Soc. Trinidad and Tobago Proc., 25 (1925), No. 1, pp. 5–10; also in Trop. Agr.* [*Trinidad*], *2 (1925), No. 3, pp. 65, 66*).—A microscopic study of the flowers of the cacao plant showed only about 5 per cent that were ever pollinated. Records taken 10 days after hand pollinations showed 5 per cent of the blooms setting, as compared with 0.3 per cent for control, unpollinated flowers. That ants and aphids are apparently important factors in cacao pollination was indicated in a 2 per cent set of the blossoms visited by these insects. Calculations showed that effective pollination occurred in about 35 per cent of the flowers visited by these insects. Comparing the set of insect-visited blossoms with that of control blossoms, the author believes that either ants or aphids or both are responsible for the large amount of pollination in the cacao. In fact, it is deemed likely that these insects constitute the principal means of pollination at the St. Augustine Experiment Station, the place of the investigation. It is also thought likely that thrips may be concerned in pollination. The occurrence of 1 per cent pollination following the elimination of crawling insects by an adhesive band is thought to be due to the activity of some nocturnal flying insect.

Variability in the setting capacity of individual cacao trees was shown in the results of hand-pollination tests, wherein certain trees failed to set any fruit while others were productive. Although the possibility of developing high-yielding cacao strains is known to be complicated by the occurrence in Trinidad of approximately 30 per cent of cross-pollination, the author believes that material benefit would accrue to the cacao-producing industry from the selection and isolation of productive strains.

Refrigeration of mango, J. E. Higgins and E. S. Punzalan (*Philippine Agr., 13 (1925), No. 10, pp. 443–449*).—Observations made in a cold storage plant at Manila upon mangoes stored at temperatures of 36, 40, 45, and 50° F. indicated that sound, green, but fully matured fruits may be held in satisfactory condition for at least 18 days at 36°. At 40° fungus injury was prevalent, and at 50° both shriveling and decay ocurred. On the basis of the results, the authors suggest that fresh mangoes might be satisfactorily shipped to Chinese and Japanese markets.

Fertilizers, cover crops, soil conditions, J. J. Skinner and C. A. Reed (*Amer. Nut Jour., 22 (1925), No. 6, pp. 90–93, figs. 4*).—Trunk measurements taken on pecan trees planted in 1918 and subjected to various fertilizer and cover-crop treatments showed that commercial fertilizers had a significant effect on the growth of the pecan tree, the trees on the three fertilized areas making average gains in circumference of 5,25, 5.25, and 5.38 in. during the period November, 1921, to January, 1924, as compared with 3.13 and 3.5 in. by trees in the two unfertilized areas. Of three complete fertilizers of varying composition, the one containing the highest percentage of nitrogen produced the greatest growth. Trees receiving limestone alone made less growth than unfertilized trees, and rock phosphate when used alone was also of no apparent benefit.

In respect to cover crops, practically no difference in tree growth responses were noted except upon the bur clover and lespedeza area, where the trees made less than average growth, a fact believed due both to the small amount of vegetation produced by these plants and to the less amount of cultivation given.

A severe freeze occurring in January, 1924, afforded an opportunity for studying the effect of soil types and soil treatments upon the amount of winter injury. That natural drainage is apparently a factor in tree injury was shown by the fact that trees located on poorly drained sections were most severely injured, while, conversely, the trees located on well-drained, coarse sand were least injured. Fertilizers had little or no effect on the amount of winter injury, as was shown by records of 55 per cent of the fertilized trees and 58 per cent of the unfertilized trees injured. The kind of cover crop also had no apparent effect on winter injury. Those trees fertilized with limestone and rock phosphate, either singly or in combination, suffered the least winter injury, a fact which is believed to be associated with their poor growth.

Seedling lilies: A report of progress of experimental studies with species of Lilium, A. B. Stout (*Jour. N. Y. Bot. Gard., 25 (1924), No. 295, pp. 185–194, figs. 6*).—Following a presentation of general information upon the production and care of seedling lilies, the author reports that of seedlings representing 29 species those of *L. speciosum*, *L. longiflorum*, *L. henryi*, and *L. croceum*×*L. elegans* have reached a flowering age. As in a previous article (E. S. R., 49, p. 141), attention is called to the fact that cross-fertilization is the rule in the lily, usually resulting not only in more seeds per capsule but also stronger seedlings than are obtained by selfing. The existence of many gradations in self- and cross-compatibilities is believed to indicate that the

freely seeding species of garden lilies are really a mixture of several strains which are naturally intercrossed in the course of open pollination.

The rose annual for 1925, edited by C. Page (*Westminster, Eng.: Natl. Rose Soc., 1925, pp. 1–221, pls. 19*).—Illustrated in color, this volume, the nineteenth annual of the National Rose Society, contains numerous brief articles relating to the origin and development of varieties, culture, etc.

America's greatest garden: The Arnold Arboretum, E. H. Wilson (*Boston: Stratford Co., 1925, pp. [10]+123, pls. 51*).—Without attempting to be complete, attention is called in a popular way to the salient features of the Arnold Arboretum, particularly to the hawthorns, flowering cherries, evergreens, etc.

Insecticides and fungicides, 1924, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 114 (1924), pp. 84–88*).—Conforming with the reports of previous years (E. S. R., 51, p. 344), herein are presented in tabular form the results of analyses of materials received from the State commissioner of agriculture during the year 1924.

FORESTRY

The influence of the depth and nature of the soil covering upon the germination of Scotch pine seed [trans. title], A. Dengler (*Ztschr. Forst u. Jagdw., 57 (1925), No. 7, pp. 385–408, pls. 2, figs. 3*).—Working at the Möller Forestry School at Eberswalde, Germany, with selected Scotch pine seed planted at different depths in carefully prepared boxes of sand, loamy sand, and humus sand, the author found that the depth of planting was a significant factor in the germination and character of the young plants. The number of plants decreased with an increasing soil depth, especially 2 cm. (0.8 in.) and above, but between 0.5 cm. (0.2 in.) and 1 cm. (0.4 in.) the differences were not great. With deep loose coverings or under very dry conditions the thicker coverings gave the better results.

The time required for germination increased with deeper coverings and with more compact soils. Furthermore, the depth of planting determined the type of growth. The length of the hypocotyl was usually about 25 mm. (1 in.), but with deep planting a larger proportion was buried beneath the soil. With increasing age the seedlings showed less and less the effect of the depth of planting, nutritional conditions apparently coming into prominence.

Insolation, a factor in the natural regeneration of certain conifers, J. W. Toumey and E. J. Neethling (*Yale Univ. School Forestry Bul. 11 (1924), pp. 63, pls. [7], figs. [9]*).—In an attempt to correlate under actual field conditions the results attained in nursery studies (E. S. R., 50. p. 443), namely, that heat at the ground surface rather than soil desiccation is the chief limiting factor to survival in conifer seedlings, plats subjected to various degrees of direct insolation were laid out in the season of 1923 in the Yale University experimental forest near Keene, N. H., using as plant material white pine, hemlock, and white spruce.

Determinations of the wilting coefficients in the surface soil of the several plats showed, with the exception of a nonweeded area, some available moisture in the surface soil for all seedlings whose roots penetrated to a greater depth than 2 in. Measurements of root penetration showed that hemlock, the slowest root grower of the three species used, was the only conifer in which mortality could be directly associated with soil desiccation. Surface soil temperatures recorded on all plats showed in the absence of shade occasional temperatures in excess of 122° F., a point sufficient to cause the death of young tender plants.

On one area, exposed to full sunlight until 1 p. m., a maximum of 152° was recorded. Young plants killed by insolation showed a distinct lesion near or at the ground surface.

To determine the lowest surface soil temperature at which these typical heat lesions occur, seedlings (white and red pines) growing in echard pans were exposed in the laboratory window to direct sunlight supplemented by heat radiated from an electric heater. Lesions remarkably similar to those occurring in the field experiments resulted from sustained surface soil temperatures of 121–123°. At 135–142° maintained for 30 minutes, all the red and 80 per cent of the white pine showed lesions. A consistent uniformity between thermocouple and standard thermometer readings was observed after the thermometer was once thoroughly heated.

Reforestation by seed sowing in the northern Rocky Mountains, W. G. Wahlenberg (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 7, pp. 637–641, figs. 2*).—The almost complete failure of direct seeding following extensive forest fires in 1910 in the Rocky Mountain region led to the inauguration of intensive studies at the Savenac Nursery, Montana, of the causes of the lack of success. Investigations at the Priest River Forest Experiment Station having shown the unreliability and costliness of broadcast and corn-planter sowing, efforts were confined to sowing on small areas from which the sod and herbaceous growth had been removed. Six species, namely, Douglas fir, Engelmann spruce, western red cedar, western yellow pine, western larch, and Norway spruce were used in the test.

The best results were secured with the Douglas fir. After six years of repeated effort, about 20 per cent of the total spots sown with this species contained one or more living trees. The application of a litter cover to the spots for the purpose of concealing the seed from rodents and the use of sulfuric acid as a soil sterilizer were both ineffective, the results not justifying the expense. Soil drying was found to be the leading cause of mortality, more deaths being due to this than to any other two causes combined, and cutworms ranked second as a factor in losses. Yellow pine, because of its large seeds, which were eagerly sought for by various rodents, was early discarded from the test.

Arboricultural investigations [at the Northern Great Plains Field Station in 1923], R. Wilson (*U. S. Dept. Agr. Bul. 1337* (*1925*), *pp. 2–8*).—A general report upon the activities of the year (E. S. R., 53, p. 145), giving in detail the results of species and planting combinations tests, cultural studies, etc. In addition to the general activities, a large amount of nursery stock was grown for distribution among settlers.

A handbook of the principal trees and shrubs of the Ancon and Balboa Districts, Panama Canal Zone (*Washington, D. C., and Balboa Heights, C. Z.: Panama Canal, 1925, pp. 97, figs. 34*).—Admirably illustrated, this small handbook is designed to serve as a guide to the more common, native, and introduced species.

Forest explorations in Suriname [trans. title], L. Gonggrijp (*Dept. Landb., Nijv. en Handel Suriname Bul. 48* (*1925*), *pp. 101, pls. 14*).—Herein are presented the results of an extended survey of forest resources.

The use of liability ratings in planning forest fire protection, W. N. Sparhawk (*Jour. Agr. Research* [*U. S.*] *30* (*1925*), *No. 8, pp. 693–762, figs. 36*).—Using as a basis for the study records of individual fires occurring on the national forests during the period 1911–1915, the author attempts to develop a method of estimating the justifiable expenditure for forest protection by rating the liability of loss and the probable cost of suppression, the sum of which is deemed to represent the total liability.

Dividing the western national forest areas into 21 subregions of fairly uniform character and species composition, the author determines for each region and as far as possible for each principal forest type within a region the correlation between size of the burned areas and the time elapsing between discovery of the fire and attack. This information, developed with a view to showing the average size that fires may be expected to attain in different elapsed periods, is used in connection with records upon the cost of suppression per unit area and the average amount of damage resulting in the several regions and various forest types. Tentative conclusions are reached concerning the total general liability per unit area in each of the several areas and in their principal forest types.

The construction of taper curves, F. S. Baker (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 7, pp. 609–624, figs. 10*).—Beginning with a discussion of various methods suggested for preparing taper curves for use in the formulation of volume tables for timber estimation, the author outlines an empirical method for constructing volume tables based upon the hypothesis that trees of a given species having the same form quotients have the same form from top to bottom, excluding the basal flare, and upon the hypothesis that form, as expressed by the form quotient, varies regularly with changes in diameter and height.

General volume table for chir (Pinus longifolia) classified by diameter (and girth) and height, S. H. Howard ([*Indian*] *Forest Bu. 58* (*1924*), *pp. 14, pls. 3*).—The figures given are based upon approximately 700 trees, of which 540 are above timber size.

General volume tables for sal (Shorea robusta) classified by diameter and height, S. H. Howard (*Indian Forest Rec., 10* (*1924*), *No. 6, pp.* [*2*]+*58, pls. 8*).—The tables presented are based upon 1,652 trees, 1,027 of which were above timber size.

DISEASES OF PLANTS

[Plant disease investigations] (*Ohio Sta. Bul. 382* (*1924*), *pp. 28–34, figs. 4*).—In connection with experiments on the control of apple scab, studies were made of ascospore discharge of the fungus from old leaves, and in spraying it was found that the most effective results were secured when the earliest application was timed to correspond with ascospore discharge.

Spraying and dusting of potatoes were compared for the control of blight and hopperburn. No late or early blight developed, but leaf hoppers were in great abundance, and the increases in yield are considered due to the control of hopperburn and to the stimulating effects of the application. In every case spraying gave marked increases in yield and proved profitable. Dusting, while not nearly as satisfactory as liquid spraying, gave considerable increase over the checks.

A study was made of some of the causes for the running out of potato varieties in Ohio, and it was proved by the use of insect cages that leaf roll, spindle tuber, mosaic, and curly dwarf were all transmitted by insects under field conditions. Counts made of plants from the best northern-grown certified seed available showed the presence of from 2 to 7 per cent of these diseases, and when seed had been grown for two years under Ohio conditions the percentage of degenerative diseases had increased to from 7 to 19 per cent.

Experiments for the control of stinking smut of wheat have shown that copper carbonate has proved satisfactory and reliable, although it has not given as good control as formaldehyde.

Investigations of the covered and loose smuts of oats are said to have shown that germination is stimulated and smut reduced by the addition of

1 part of copper or nickel salt to 2 parts of mercuric chloride. This mixture, used at the rate of 3 oz. per bushel of treated grain, gave good control of smut, although the cost of the treatment was relatively high.

A monographic contribution on the genus Peronospora [trans. title], E. GÄUMANN (*Beitr. Kryptogamenflora Schweiz, 5 (1923), No. 4, pp. 360, figs. 166*).—This is a monographic account of the species of Peronospora and their synonyms, with an extensive bibliography.

Puccinia mirabilissima Peck: A new British record, M. WILSON (*Bot. Soc. Edinb. Trans. and Proc., 28 (1922–23), pt. 4, pp. 164–167, fig. 1*).—Record is made of the occurrence in the vicinity of Edinburgh of *P. mirabilissima*, hitherto reported, it is claimed, only from parts of the United States.

Rhizopus artocarpi: Its cultural characters and its relation to Rhizopus nigricans, J. CRISANTO (*Philippine Agr., 12 (1924), No. 10, pp. 465–468*).—The male inflorescences and young fruits of the jak-fruit (*Artocarpus integrifolia*) are so attacked by *R. artocarpi* that a soft rot kills before maturity all but a small percentage. In the present work, studies were made on the behavior of the fungus in the tissues of the host, on its morphology in culture and in natural infection, and on the relation of *R. artocarpi* to *R. nigricans*. The conclusion derived from this work is that *R. artocarpi* and *R. nigricans* are distinct species.

The production of conidia at night in species of Sclerospora, W. H. WESTON, JR. (*Abs. in Phytopathology, 13 (1923), No. 1, p. 34*).—In a previous publication (E. S. R., 47, p. 244) the author reported that two species of Sclerospora in the Philippines produced their conidia only at night when the plants were covered with dew. Subsequent studies of other oriental species, as well as the cosmopolitan *S. graminicola*, have indicated that these species show the same peculiarity.

The toxicity of copper for fungi [trans. title], R. DUBOIS (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 21, pp. 1498–1500*).—Attention is drawn to a communication by the author in 1890[4] regarding the nontoxicity of copper for yeasts and fungi. He concludes that, as previously indicated, it is incorrect to attribute to copper or its salts a directly toxic property. It destroys parasites by an action which, it is claimed, may be compared with that of oxidizing or peroxidizing zymases.

The toxicity of copper sulfate to the spores of Tilletia tritici (Bjerk.) Winter, F. N. BRIGGS (*Calif. Univ. Pubs. Agr. Sci., 4 (1923), No. 13, pp. 407–412, fig 1*).—A brief review of the work of early investigators serves to show that the growth of most fungi is inhibited by contact with rather low concentrations of copper compounds. To ascertain how individual spores of *T. tritici* are affected, as regards germinability, by dipping in a copper sulfate solution, is the object of the study here briefly described.

It was found that, in a culture solution consisting of a water extract of San Joaquin sandy loam soil, a 0.002 N concentration of copper sulfate inhibits the germination of spores of *T. tritici*. At 0.0008 and 0.001 N there was very little germination and that little was abnormal in character, the promycelium being short and distorted and probably not capable of causing infection. At 0.0006 N copper sulfate, germination was still abnormal in nearly all cases. At 0.00002 to 0.0004 N, germination appeared to be normal, though some copper injury was caused at concentrations of 0.0004 and 0.0006 N.

Helminthosporium spp. on cereals and sugarcane in India.—Part I, Diseases of Zea mays and Sorghum vulgare caused by species of Helminthosporium, M. MITRA (*India Dept. Agr. Mem., Bot. Ser., 11 (1923), No. 10,*

[4] Compt. Rend. Acad. Sci. [Paris], 111 (1890), pp. 655–657.

pp. [2]+219–242, pls. 3).—Comparative studies show the Helminthosporium on *Z. mays* and on *S. vulgare* to be identical morphologically, though of different strains, each of which, however, can infect both of these plants, besides wheat, barley, oats, and sugar cane. Infection by this fungus, *H. turcicum*, may occur by way of the stomata, or else by piercing the cuticle and cell walls. The perfect stage was not observed on any of the media used.

Effective dust treatments for the control of smut of oats, R. C. THOMAS (*Science, 61 (1925), No. 1567, pp. 47, 48*).—Attention is called to the successful use of copper carbonate for the control of the covered smut of wheat, but three years' trial at the Ohio Experiment Station showed that no copper or nickel compound used alone as a dust was adequate for the control of oats smut. However, when they were combined with corrosive sublimate not only was there an effective control of smut but germination was stimulated.

Relations between climate and wheat rust development [trans. title], J. BEAUVERIE (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 8, pp. 529–531*).—Comparative field and plat observations made during the summer months of 1921–1922 as regards the effect of climatic conditions (weather) on the development of *Puccinia glumarum*, *P. graminis*, and *P. triticina* are outlined, these observations as detailed taking account also of varietal susceptibilities.

Disease resistant strains of vegetables, C. B. SAYRE (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 156–163*).—This paper and discussions thereof relate to a few important Illinois vegetable crops, particularly strains resistant to diseases important locally, namely, cabbage (yellows, *Fusarium* sp.), tomato (wilt, *Fusarium* sp.), asparagus (rust), spinach (blight or yellows), watermelon (wilt), and cantaloupe (rust).

The effect of varying soil moistures on healthy bean plants and on those infected by a root parasite, W. H. BURKHOLDER (*Ecology, 5 (1924), No. 2, pp. 179–187*).—The author has shown previously (E. S. R., 42, p. 147) that bean plants infected with the root dry rot pathogene (*Fusarium martii phaseoli*) vary considerably in yield from year to year. Experimentation, admittedly somewhat preliminary in character, which was carried on in 1920 (E. S. R., 45, p. 336) was followed by more carefully planned experiments in 1921 and 1922 with Wells Red Kidney beans, the results of which are now presented. Judging from yield, the optimum soil moisture for healthy bean plants is about half the water capacity of the soil. Plants dwarfed by drought at 33 per cent up to blooming time show rather quick response if then raised to the medium moisture (50 per cent), and a quicker response if made moderately wet (67 per cent). Plants grown in medium wet and wet soils yield better if the soil moisture remains constant than if the moisture is changed at the time of blooming (except possibly in case of change from wet to medium wet).

Plants infected with *F. martii phaseoli* show greater yield reduction in dry than in medium wet or wet soils. These plants do not react as do healthy plants to additions of moisture at blooming time, even a comparatively good yield requiring plenty of soil moisture extending through budding time.

The most outstanding conclusion obtained from this work is that this plant is very sensitive to the soil moisture condition, any variation or change from the optimum altering the yield considerably. Also, infection with *F. martii phaseoli* increases sensitiveness of this plant to changes in soil moisture.

The disinfection of beet seed against root blight [trans. title], H. C. MÜLLER and E. MOLZ (*Ztschr. Ver. Deut. Zuckerindus., No. 810 (1924), pp. 23–37, figs. 2; abs. in Facts About Sugar, 18 (1924), No. 12, p. 283*).—Study during five years shows that corrosive sublimate at 0.2 per cent, when used for six hours to steep beet seed, prevents satisfactorily the development of root

blight, or rot, but that this treatment greatly decreases germinability. The differing effects of several treatments are indicated, some of these apparently causing increase of growth even when no disease was apparent.

Diseases of cabbage and their control, C. B. SAYRE (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 387–395*).—Cabbage disease control is discussed mainly from the viewpoint of prevention, dealing more specifically with the two seed-borne diseases black rot and blackleg, and with four others, yellows (wilt), clubroot, root knot, and damping-off. All of these are internal, so that none of them can be reached by spraying.

Dry rots of corn and their control, L. W. DURRELL and D. R. PORTER (*Iowa Agr. Col. Ext. Bul. 122 (1924), pp. 8, figs. 8*).—Descriptions are given of the dry-rots of corn caused by *Diplodia zeae* and *Basisporium gallarum*. The selection of seed ears, germination tests, and crop rotation, so that corn shall not occupy the land for more than two years in succession, are recommended as means for preventing losses due to these diseases.

The life history of the Texas root rot fungus, Ozonium omnivorum Shear, C. L. SHEAR (*Jour. Agr. Research [U. S.], 30 (1925), No. 5, pp. 475–477, pl. 1, figs. 2*).—The author describes as *Hydnum omnivorum* n. sp. what he believes to be the perfect form of the Texas cotton root rot fungus generally referred to as *O. omnivorum*. The fungus described was found on the Osage orange (*Maclura aurantiaca*), not far from dead and dying cotton plants. The perfect stage of the fungus is believed to occur as a saprophyte also, as similar specimens were found on overwintered cotton stalks killed by the root rot. All efforts to grow the fungus from the Hydnum failed.

Crucifer white rust [trans. title], E. NOFFRAY (*Jour. Agr. Prat., n. ser., 41 (1924), No. 17, pp. 343, 344*).—Hosts of the crucifer white rust organism, *Cystopus candidus*, as indicated, include a number of plants, of which *Capsella bursa pastoris* is perhaps the most dangerous. Control measures are outlined.

Infection and dissemination experiments with degeneration diseases of potatoes.—Observations in 1923, E. S. SCHULTZ and D. FOLSOM (*Jour. Agr. Research [U. S.], 30 (1925), No. 6, pp. 493–528, pls. 10, fig 1*).—In a previous publication (E. S. R., 50, p. 46), the authors described a number of degeneration diseases of potatoes. Further investigations were conducted on the possible occurrence of other diseases of this type, different combinations of diseases from those previously reported, insect carriers, and alternate hosts. The authors report new symptoms of diseases, among them spindling sprouts as an occasional symptom of leaf roll, streaks and spots on corollas as symptoms of streak, tuber cracking as a current season symptom of unmottled curly dwarf inoculation, and crinkle mosaic, which is tentatively distinguished and is considered unrelated to crinkle.

Field and greenhouse inoculation experiments are reported upon in which the possibility of direct inoculation through leaf mutilation, by insect carriers, and by direct contact was investigated. Leaf-mutilation inoculations of the Green Mountain variety are said to have caused infection with mild mosaic, leaf-rolling mosaic, rugose mosaic, spindle tuber, unmottled curly dwarf, and streak, and also with various combinations of these diseases. This was followed by their natural spread from inoculated hills to adjacent hills, especially by mild mosaic.

Intervarietal leaf-mutilation inoculations of Green Mountain potatoes transmitted mild mosaic and crinkle mosaic from Bliss Triumphs; leaf-rolling mosaic, rugose mosaic, spindle tuber, and unmottled curly dwarf from Rurals; rugose mosaic from seedling potatoes; and leaf-rolling mosaic, rugose mosaic, and spindle tuber from Irish Cobblers.

Intervarietal leaf-mutilation inoculations in insect cages showed that a repetition of the inoculation favored infection with mild mosaic and spindle tuber; that every one of several varieties tested was susceptible to spindle tuber; that Irish Cobblers either are symptomless carriers of mild mosaic or are resistant or immune to this disease; that mosaic dwarf is sometimes a combination of rugose mosaic, spindle tuber, and streak; and that there is a varietal difference in susceptibility to streak. It was found that aphids sometimes do not transmit disease under conditions that are apparently the same as those giving positive results.

With regard to current-season symptoms, a progressively smaller amount of infection was induced by leaf-mutilation inoculation with the leaflets, entire shoots, stems and petioles together, seed tubers, and roots, respectively, of rugose mosaic plants. Similar inoculation with juice from mild mosaic Green Mountain shoots and from certain mottled Irish Cobbler shoots, and the use of the latter in grafts, produced no apparent effects. Inoculation with the seed-cutting knife gave negative results with seven diseases and several combinations.

Aphid inoculations in insect cages produced current-season symptoms in Green Mountains with four types of mosaic—mild, leaf rolling, rugose, and crinkle mosaic. The symptoms of rugose mosaic following aphid inoculation were less marked than after parallel leaf-mutilation inoculations. Mild mosaic in the eighth consecutive generation of a Green Mountain strain was still mild and was distinct from other types of mosaic. Other aphid inoculations produced symptoms of three disease combinations—rugose mosaic and spindle tuber, crinkle mosaic and spindle tuber, and leaf-rolling mosaic and leaf roll.

Root and foliage contact with spindle tuber plants under insect-free greenhouse conditions resulted in no transmission. In another greenhouse contact of roots and leaves and of leaves in the absence of aphids and leaf mutilation, but in the presence of other kinds of insects, was accompanied by the dissemination of mosaic but not of leaf roll. A third species of aphids (*Aphis abbreviata*), which overwinters on the buckthorn, was found capable of transmitting mild mosaic.

In a test to determine the effect of locality on the dissemination of these diseases, mild mosaic Bliss Triumph tubers were planted in Virginia, Long Island, and northeastern Maine. In Virginia less distinct mottling was observed, but there was more rugose mosaic, leaf roll, and spindle tuber than on Long Island, and least of all in northeastern Maine. Somewhat similar results were obtained in a comparison of healthy commercial stocks of five varieties, and it is concluded that a hot climate may cause degeneration of potatoes indirectly through favoring the spread of diseases.

The seed-corn maggot and potato blackleg, J. G. Leach (*Science, 61 (1925), No. 1570, p. 120*).—The author has obtained evidence that indicates that the seed-corn maggot (*Phorbia fusciceps*) is an important agent in conveying potato blackleg in Minnesota, and also that the insect may function biologically in transmitting the disease, thus providing an important means of hibernation. Several hundred seed pieces partly decayed by *Bacillus phytophthorus*, planted in wet and dry soil, failed to become diseased, while sound seed pieces bearing eggs of the insect showed blackleg symptoms, and larvae of the insect were found in all the seed pieces from which blackleg developed.

The action of insoluble oxides on potato late blight [trans. title], Mr. and Mrs. G. Villedieu (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 8, pp. 534–536*).—In a paper previously noted (E. S. R., 45, p. 49) the authors claimed to have shown that if to certain completely neutral nutritive media there be added oxides of little or no solubility, such as the oxides of copper or of cad-

mium, vegetative growth of certain fungi, as *Penicillium glaucum* or *Mucor mucedo*, is completely inhibited. The complete insolubility of the oxides, however, is not certain in such a complex medium. The authors have therefore undertaken to study the behavior of such oxides in connection with the production of conidia of *Phytophthora infestans* in hanging drop cultures supposedly reducing to extreme simplicity the conditions employed in this work. These include a temperature of 18° C., several oxides mentioned, and double-distilled water, part of which was shaken up with the oxide frequently during 24 hours to induce solution if possible, part shaken with the pulverized oxide, and part treated so as to include both the supposed solute and solid small particles of the oxide.

In the water supplied with supposedly insoluble oxides, the life processes of the fungus appeared normal. In the water containing the finely pulverized metal, sporulation occurred sparingly or not at all, according as the particles were coarse or fine, and any spores formed soon died. In long drops the spores behaved differently, being inhibited according to their proximity to the finer particles of the metal.

Oxides insoluble or slightly soluble used in these tests included those of cadmium, nickel, cobalt, zinc, copper, and mercury, all being found to be toxic on contact. This toxicity is thought to be due, in part at least, to the basicity of the oxides. In the presence of Bi_2O_3, Fe_2O_3, Al_2O_3, Cr_2O_3, Pb_3O_4, MnO_2, the fungus lived and germinated normally. When the toxic oxides are acted on by organic or mineral acids, the resulting salts in solutions are not toxic if the concentrations range below certain values which are given, and which are indicated as differing in toxicity according to the acid or metal employed.

Potato canker [trans. title], V. DUCOMET (*Jour. Agr. Prat., n. ser., 41 (1924), No. 10, pp. 196–198, figs. 2*).—A brief account, with maps, is given of the geographical distribution and varietal incidence of potato black wart in the British Isles and adjacent Europe.

Influence of soil moisture and acidity on the development of potato scab, W. H. MARTIN (*Soil Sci., 16 (1923), No. 1, pp. 69–73*).—As a result of potato scab infection and control studies during three years of widely differing conditions as regards weather, especially rainfall, at the New Jersey Experiment Stations, considerable data have been accumulated on the relation of the scab organism to soil conditions, and these are presented in detail and in tabular form.

In the light of the results shown it appears that, while soil moisture is an important factor in determining the amount of scab, soil acidity is of equal and probably of greater importance, since with the same moisture content scab is less severe on acid than on alkaline soils.

Potato verticilliose [trans. title], G. GAUDOT (*Jour. Agr. Prat., n. ser., 42 (1924), No. 29, pp. 54, 55, pl. 1*).—Potato verticilliose (*Verticillium alboatrum*) was very severe in 1923, as is usual in dry years or weather. This was particularly true in case of the varieties Nithsdale, Beauvais, Abundance, Eigenheimer, Improved Burbank, and Great Scot. Apparently, selection is the only protective measure that can be considered reliable.

Streak disease in Uba cane, H. H. STOREY (*So. African Sugar Jour., Cong. and Exhib. No., 1924, pp. 63–66, figs. 2; also in La. Planter, 73 (1924), No. 14, pp. 268–270, fig. 1*).—The author, who is government mycologist at Durban, having had under investigation for a year or more a sugar cane disease never previously described for any country, states that it bears resemblance in several ways to mosaic, though evidently quite distinct therefrom. It is presumed to be caused by the same type of ultramicroscopic agent.

The streaks when held up to the light appear almost transparent, whereas mosaic streaks show some green or yellow coloration. The disease is spread, primarily, by planting diseased stock (sets), though a second method of spread operates, the disease passing to adjacent healthy plants, apparently through the air and not through the soil, and possibly being carried by sucking insects. Under certain circumstances, the spread may be rapid and wide. Careful estimates give, on an average, 10 per cent as the actual or perhaps minimum degree of loss due to this trouble.

The effects of Uba cane streak may not be cumulative, but planters are advised to use as sets only healthy cane. Careful selection of seed canes, as a test case, resulted in a field of cane entirely free from streak. The diseased young cane shoots show the characteristic markings plainly from the moment of their unfolding, and so are readily detected. Early and frequent roguing is recommended as probably sufficient in lightly infected areas. The nursery should be free from disease and at least 400 yds. from any canes showing this type of streak disease.

The control of sugar cane diseases, D. S. North (*Aust. Sugar Jour., 14 (1923), No. 12, pp. 687–693; 15 (1923), Nos. 1, pp. 9–24; 2, pp. 73–79, 81–83*).—Sugar cane diseases have recently been freely imported into Australia and have become widely disseminated. Three types of running-out diseases are described, and a plan is offered detailing measures designed to protect growers against these diseases. References are provided to related contributions and other information.

***Experiments on the cultivation of the active agent of mosaic disease of* tobacco and tomato,** P. K. Olitsky (*Science, 60 (1924), No. 1565, pp. 593, 594*).—The experiments reported relate to the cultivation of the causal agent of the mosaic diseases of tobacco and tomato. Aqueous extracts from young tomato plants that experiments showed were free from mosaic were inoculated with small quantities of juice from diseased tomato and tobacco plants, and after from 7 to 10 days in a dark cabinet at a temperature of from 28 to 30° C. the medium containing the mosaic material showed a faint, uniform, translucent, almost imperceptible haze.

To determine whether the agent of mosaic disease had multiplied, inoculations were made of extreme dilutions, and the disease was produced.

The conclusion seems justified that the incitant of mosaic disease of tobacco and tomato is a living microbic body which can be cultivated in an artificial medium.

Observations on fruit diseases in 1924, H. W. Anderson (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 243–259*).—A statement is presented undertaking to cover the fruit disease situation in Illinois as observed during the previous 10 years. It embodies data on the variation in behavior during that period of apple scab, blotch, rust, fire blight, black root rot (Xylaria root rot), bitter rot, and a new fruit rot (Coniothyrium fruit spot); pear fire blight, Fabraea leaf blight, and scab; peach black mold or Rhizopus rot, brown rot, and bacterial shot hole; cherry leaf spot or yellow leaf; grape downy mildew, black rot, anthracnose, surface mildew, and winter injury; raspberry crown gall; blackberry leaf anthracnose; and the bramble diseases, mosaic, bramble streak, and leaf curl.

Some results of spray experiment at Tunnel Hill, Illinois, 1924, R. L. McMunn (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 260–273*).—Spraying experimentation carried on in Johnson County in 1924 is detailed as relating to control of local fruit diseases, particularly scab, bitter rot, and blotch, with other data.

Of the sprays employed, the boiled oil emulsion-Bordeaux gave the best apple blotch control, somewhat better than plain Bordeaux. Some russeting was produced. Lime sulfur caused on some plats severe leaf injury but slight fruit injury.

No decisive results were secured as to the possibility of omitting, delaying, or weakening the Bordeaux or Bordeaux plus Kayso to be used as a prebloom scab spray. Dry lime and sulfur mixture control was not so good as that from lime sulfur, probably on account of poor adhesiveness. Indefinite results were obtained from the use of strong lime sulfur or from Bordeaux plus oil emulsion as dormant spray for bitter rot control. Boiled oil emulsion-Bordeaux controlled bitter rot and blotch; but this caused russeting, severe on Ben Davis but slight on Jonathan apples. Cold mix oil-Bordeaux checked bitter rot, though blotch control was better in case of Bordeaux or boiled oil emulsion-Bordeaux. On Duchess, boiled oil emulsion-Bordeaux gave better control than did Bordeaux or lime sulfur.

Apple and pear scab and apple blotch, H. W. Anderson (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 364–374*).—These three diseases are discussed from the standpoint of the northern Illinois orchardist as regards their distribution, spread, effects, and control.

Spraying at the Southeastern Test Farm and in Washington County (*Ohio Sta. Bul. 382 (1924), pp. 43, 44*).—Spraying experiments for the control of apple scab and blotch in southeastern Ohio have been in progress since 1922 (E. S. R., 51, p. 748), and it is stated that among the outstanding results has been the excellent control of apple scab by the use of very dilute Bordeaux mixture. The lime-sulfur sprays, from both the commercial concentrated solution and dry or powder form, proved their excellence for the control of scab on the Southeastern Test Farm. Colloidal sulfur was tested for the first time in 1924, and it was found to possess none of the caustic or corrosive properties characteristic of lime sulfur and Bordeaux mixture. Hydrated lime is said to have exerted a distinctly fungicidal effect in the control of apple scab when used throughout the spraying season in combination with arsenate of lead.

Three years' experiments for the control of apple blotch on Ben Davis apple trees have shown equally good results where Bordeaux mixture was used in widely different strengths, varying from 3–9–50 to 0.75–2.25–50. Lime sulfur gave excellent control, and the fruit was smoother and better where this spray was used. Colloidal sulfur gave 94 per cent sound fruit and hydrated lime 96 per cent.

The testing of lime alone was made to determine its fungicidal value. The results indicate that it had considerable influence in holding these diseases in check, but lacked the invigorating effect on the foliage of the apple which is notable from the use of the sulfur and copper compounds.

Spraying for apple scab and apple blotch, F. H. Ballou and I. P. Lewis (*Ohio Sta. Mo. Bul., 10 (1925), No. 3–4, pp. 50–52*).—A paper embodying data noted above.

Studies of spore dissemination of Venturia inaequalis (Cke.) Wint. in relation to seasonal development of apple scab, C. N. Frey and G. W. Keitt (*Jour. Agr. Research [U. S.], 30 (1925), No. 6, pp. 529–540, fig. 1*).—By means of an air filter the authors made a study of the dissemination of the ascospores of the apple scab fungus. The experiments were conducted in 1917, when it was found that the natural discharge of spores in the vicinity of Madison, Wis., began May 19. Following this date ascospore discharges occurred during rains throughout the spring and early summer, the last recorded discharge occurring

on July 18. The heavy discharges were limited to the period May 19 to June 7, after which the discharges were relatively small.

It was found that, when the asci were in condition to eject their spores, the presence of an adequate supply of water was the most important requisite for their discharge, dew not being sufficient to induce discharge of spores of any consequence. Heavy discharge started soon after rain began and continued with continuous rain as long as the supply of ripe asci lasted. These periods lasted from 3 to 15 hours. Conidia were found in the air only during rain periods, and particularly when rain was accompanied by strong wind. They are said to be disseminated chiefly in meteoric water acting under the influence of wind and gravitation.

Bagging experiments and orchard observations showed that most of the leaf infection of the season occurred during the period of May 19 to June 2. Fruit infections were observed on June 8 and continued to appear throughout the period of observation, which ended August 24. Infection from conidia applied in suspension in water was readily secured upon young leaves at fairly low temperatures, but old leaves were highly resistant to infection.

Prevention of apple scald with oiled paper, W. A. Ruth (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 229–233*).—The oiled paper wrap is declared to be remarkably successful in preventing scald.

Phytophthora rot of pears and apples, D. H. Rose and C. C. Lindegren (*Jour. Agr. Research [U. S.], 30 (1925), No. 5, pp. 463–468, pls. 2*).—A description is given of a rot of pears and apples found in the Chicago market that is said to be caused by a fungus similar to or identical with *P. cactorum*. When the fungus was inoculated into healthy pears and apples the disease was readily produced.

Some observations on bacterial shot hole of peach, H. W. Anderson (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 488–505*).—The attempt was made to present succinctly what had become known regarding peach leaf bacterial shot hole during the 10 years since that disease first attracted attention in Illinois, also what may become known and what needs to become known to effect the control of this serious peach disease.

Relative susceptibility of citrus varieties to attack by Gloeosporium limetticolum (Clausen), H. R. Fulton (*Jour. Agr. Research [U. S.], 30 (1925), No. 7, pp. 629–635*).—In order to determine the extent to which *G. limetticolum* can infect varieties of citrus other than the West Indian limes, field and greenhouse inoculations were conducted with a large number of species and varieties of citrus, and aside from the West Indian and Dominican Thornless limes, which were severely attacked, the only positive inoculations were secured with some very susceptible strains of citron. A number of species under greenhouse conditions showed some doubtful infections, but nearly all, except as above noted, were immune or highly resistant to the fungus.

Coconut bud rot experiments in Porto Rico, C. M. Tucker (*Science, 61 (1925), No. 1572, pp. 186, 187*).—Coconut bud rot is stated to be epidemic on the west coast of Porto Rico, between Mayaguez and Rincon. Brief description is given of the disease, from which no recovery occurs. A fungus has been isolated from diseased buds and described as a small chlamydospored strain of *Phytophthora faberi*. This proves to be pathogenic to wounded tomatoes, potatoes, and green coconuts, but not to cacao pods, in this respect agreeing with the strain isolated from bud rot coconuts in Jamaica by Ashby (E. S. R., 46, p. 453). Inoculation tests prove the fungus isolated from bud rot coconut to be able to kill wounded or unwounded mature palms with

the appearance of typical bud rot symptoms. Bacteria resembling *Bacillus coli*, regarded by Johnston (E. S. R., 26, p. 649) as the cause of coconut bud rot in Cuba, were also isolated from diseased buds, but inoculation proved the inability of these bacteria to penetrate healthy mature palms or to cause symptoms on inoculation differing from those of the check wounds.

High precipitation during at least part of the year is considered the most important factor in the development of bud rot epidemics. Eradication measures reduced bud rot incidence in an experimental grove.

Diseases of glasshouse plants, W. F. BEWLEY (*London: Ernest Benn, Ltd., 1923, pp. 208, pls. 16, figs. 20*).—"The main object of this book is to bring before growers of glasshouse plants the fundamental principles of disease control, . . . to supply more detailed information in reply to many inquiries. . . . An attempt has been made to describe the chief diseases of glasshouse plants in this country. . . . Special attention is paid to methods of control."

Notes on some Antirrhinum diseases, W. BUDDIN and E. M. WAKEFIELD (*Gard. Chron., 3. ser., 76 (1924), No. 1966, pp. 150–152, figs. 6*).—Antirrhinum diseases here dealt with include stem rot and leaf spot due to *Phyllosticta antirrhini*, leaf disease due to *Cercosporella antirrhini*, and leaf spot due to *Septoria antirrhini*.

The life history of Pilacre faginea (Fr.) B. & Br., C. L. SHEAR and B. O. DODGE (*Jour. Agr. Research [U. S.], 30 (1925), No. 5, pp. 407–417, pls. 2*).—A report is given of life-history studies of *P. faginea*, a fungus the affinities of which have been imperfectly known. The fungus occurs as a saprophyte on beech logs, but has also been found on maple, hornbeam, and other hardwoods. It is said to possess two distinct stages of development, the gametophytic and sporophytic, differing in the color and character of the mycelium and in the character and method of production of the spores. The conidial stage is said to have the general appearance of a hyphomycete similar to Rhinotrichum or *Haplaria*, while the basidial stage has the general characteristics of a basidiomycete. The evidence accumulated by the authors has led them to regard the fungus as a protogasteromycete, whose nearest known relative appears to be Tulostoma. The authors adopt and recommend the application of the name *P. faginea*. This fungus was not found to have any relation to Roesleria, which some authors have considered as its perfect stage.

Relation of weather conditions to the spread of white pine blister rust in the Pacific Northwest, L. H. PENNINGTON (*Jour. Agr. Research [U. S.], 30 (1925), No. 7, pp. 593–607, figs. 2*).—The white pine blister rust, which has been known to occur in British Columbia since 1910, has spread to the northern and eastern limits of the western white pine in that Province, but it has spread very slowly toward the south. This is attributed by the author to the direction of the winds and the diminished rainfall.

Prevailing westerly winds are said to favor aeciospore dispersal from the coast toward the east. Northerly winds, which favor aeciospore dispersal to the south, are most common in dry seasons, which are unfavorable for pine infection. West of the Cascade Mountains, northerly winds in the period of aeciospore production increase to the southward as far as northern California, while the amount of summer precipitation diminishes southward. The author believes the rust is practically certain to spread southward at a much slower rate than to the north and east, and that the spread in eastern Washington, Idaho, and Montana may be greatly retarded by the elimination of *Ribes nigrum* from that region.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Index animalium, C. D. SHERBORN (*London: Brit. Mus. (Nat. Hist.), 1922, Sect. 2, pt. 1, pp. CXXXI+128; 1923, pts. 2, pp. 129–384+CXXXIII–CXXXVI; 3, pp. 385–640; 1924, pts. 4, pp. 641–943; 5, pp. 945–1196*).—These first five parts of the second section of the Index animalium (E. S. R., 14, p. 551), which will list the generic and specific names applied to animals for the period 1801 to 1850, includes the bibliography and the part of the index extending to Ceyl.

The field rat in Hawaii and its control, C. E. PEMBERTON (*Hawaii. Sugar Planters' Sta., Ent. Ser. Bul. 17 (1925), pp. [5]+46, figs. 28*).—This is a report upon the results obtained in work commenced by W. P. Naquin in 1918. During that year careful counts showed that between 30 and 40 per cent of the stalks of sugar cane were attacked by this rodent, indicating that neither the mongoose nor the rat-catching then carried on was sufficient to keep this pest within economic limits.

Tests during 1919 and 1920 of most of the commercial rat poisons on the market resulted in finding them too expensive for application on such a large scale. In 1920 successful results were obtained in efforts to protect the individual baits of barium carbonate from moisture, which causes them to deteriorate very quickly under field conditions, by coating them with a thin layer of paraffin. Since some of the rats would not eat these paraffin-coated cakes of barium carbonate, small packages, or torpedoes, of strychnine-covered wheat were used, being distributed systematically in great numbers. With a view to checking up the results obtained since 1920, observations were commenced by the author in 1923, and are here reported upon.

The report includes accounts of the breeding, food, and nesting habits, rat abundance, extent of damage, and control measures, including traps, virus, poisons, poison work in Hawaii, poison formulas, field poisoning at the Honokaa Sugar Company, methods of poison application, natural enemies of rats, the Rodier theory of control, and observations upon the rat fleas and bubonic plague, and the climatic factors influencing them.

On the alimentary tracts of squirrels with diverse food habits, A. B. HOWELL (*Jour. Wash. Acad. Sci., 15 (1925), No. 7, pp. 145–150, figs. 2*).—The author's studies have led to the tentative conclusion that in comparing the intestinal tracts of a nut-eating and a grass-eating squirrel the size of the stomach is not of great import. "Muscularity is important in reducing fibrous substances, but a stomach may compensate for lack of great size in handling quantity by passing the contents quickly on to the small intestine and thence to the cecum, both of which must then be of larger diameter and more specialized than is necessary in the case of the animal which feeds chiefly upon nuts."

Effectiveness of calcium cyanide in poisoning the pocket gopher, Geomys bursarius (Shaw), F. L. WASHBURN and C. E. MICKEL (*Minnesota Sta. Tech. Bul. 27 (1925), pp. 3–14, fig. 1*).—In eradication work with the pocket gopher, the authors used calcium cyanide flakes and "A" dust, both of which gave poor results both on clay and sandy soils. Of the several methods of application employed, all gave similar results. It is pointed out that the cost of using calcium cyanide in killing pocket gophers, at the rate of 2 oz. per runway, is about 10 times that of poison vegetable baits.

The control of voles with Danysz virus [trans. title], R. RÉGNIER (*Rev. Zool. Agr. et Appl., 23 (1924), No. 11, pp. 249–263, pl. 1*).—The author concludes that Danysz virus when well prepared will give excellent results.

Danish birds of the house and garden, O. HELMS (*Danske Fugle ved Hus og i Have. Copenhagen: G. E. C. Gads, 1924, pp. 109+[3], pls. 14, figs. 36*).—This is a popular account.

The birds of Portugal, W. C. TAIT (*London: H. F. & G. Witherby, 1924, pp. XII+260, pls. 11*).—A sketch of the chief physical features of Portugal, first presented (pp. 1–5), is followed by a discussion of migration (pp. 5–19) and an account of the birds of Portugal (pp. 21–228). A list of some of the ornithological publications consulted (pp. 231, 232) and a list of the ringed birds recovered in Portugal 1910–1922 (pp. 233–244) are appended.

External parasites of birds and the fauna of birds' nests, I. D. DOBROSCKY (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 48 (1925), No. 4, pp. 274–281*).—This paper includes a review of the literature on the subject and a report of studies conducted at Ithaca, N. Y., on *Protocalliphora avium*, a parasite of the crow. This parasite has been previously referred to by Coutant (E. S. R., 34, p. 359) under the name *P. azurea* Fall. A list of 8 references to the literature is included.

The brown and grey snails: Two destructive garden pests (Helix aspersa Muller and Helix pisana Muller), D. GUNN (*Union So. Africa Dept. Agr. Jour., 9 (1924), No. 4, pp. 355–362, figs. 2*).—This is an account of two snails imported from Europe, which have been known for many years in the Cape Peninsula, Port Elizabeth, Uitenhage, and several other places as serious pests. They feed upon a large number of plants, both cultivated and wild.

Hookworms of the genus Uncinaria of the dog, fox, and badger, B. H. RANSOM (*U. S. Natl. Mus. Proc., 65 (1924), Art. 20, pp. 5, pl. 1*).—The author finds *U. polaris* Looss to be a synonym of *U. stenocephala* Raill., a parasite in the intestine of the dog in Europe and common in fur foxes in North America. He concludes that *U. criniformis* (Goeze) and *U. stenocephala*, considered by Looss to be identical (E. S. R., 32, p. 759), represent separate species.

A new species of round worm of the genus Trichostrongylus from the rabbit, H. W. GRAYBILL (*U. S. Natl. Mus. Proc., 66 (1924), Art. 11, pp. 2, pl. 1*).—*T. affinis* n. sp., taken from the large intestine of a wild rabbit at Princeton, N. J., is described. In addition to this nematode, the author found the rabbit to be infested with *Obeliscus cuniculi*, previously described by him from the domestic rabbit,[5] and with *T. calcaratus* Rans.

Note on Nosema adiei (Christophers, 1922), H. E. SHORTT and C. S. SWAMINATH (*Indian Jour. Med. Research, 12 (1924), No. 1, pp. 181–184, pl. 1*).—This note relates to the species discovered by H. A. Adie in 1921 in the salivary glands of *Cimex rotundatus*, and described by S. R. Christophers in 1922 as *N. adiei*. Thus far the parasite has been observed in species of Cimex only.

The rickettsiae and their relationship to disease, S. B. WOLBACH (*Jour. Amer. Med. Assoc., 84 (1925), No. 10, pp. 723–728*).—The author concludes that the term "rickettsia" should be applied only to microorganisms adapted to arthropods and pathogenic for vertebrates and having the following characteristics: Small size, pleomorphism, slight affinity for aniline dyes, and intracellular habitat in the arthropod host. It is pointed out that practically nothing is known about the nonpathogenic, rickettsia-like, intracellular microorganisms of arachnids and insects, whether casually present or in the rôle of symbionts. The work so far done in this field has been superficial and evasive of the main problems concerning relationships between microorganisms and hosts; it has, however, served to obscure the status of the pathogenic rickettsiae. That *Dermacentroxenus rickettsi* is the cause of Rocky Mountain spotted fever, and that *Rickettsia prowazeki* is the cause of typhus, is consid-

[5] Parasitology, 15 (1923), No. 3, p. 340.

ered by the author to have been proved. There is said to be strong presumptive evidence that *R. pediculi* is the cause of trench fever. It is certain that the rickettsiae represent a new group of microorganisms, and probable that other pathogenic ones will be found.

Experimental infection of rats and mice with the common intestinal amoebae of man, J. F. Kessel (*Calif. Univ. Pubs. Zool., 20 (1923), No. 19, pp. 409–430, pls. 2*).—The author has experimentally transferred infections of five species of human intestinal amebas to rats by feeding them human feces containing cysts of these amebas, namely, *Endamoeba dysenteriae*, *E. coli*, *Councilmania lafleuri*, *Endolimax nana*, and *Iodamoeba bütschlii*. A list is given of 21 references to the literature cited.

The distinguishing characteristics of the parasitic amoebae of culture rats and mice, J. F. Kessel (*Calif. Univ. Pubs. Zool., 20 (1924), No. 23. pp. 489–544, pls. 6, figs. 3*).—In the course of an investigation, conducted with a view to determining whether or not rats may become infected with *Endamoeba dysenteriae*, it was found necessary first to determine the amebas that normally inhabit the intestinal tract of rats and mice. In this paper the author describes the three species found in the intestinal tract of culture rats and mice, namely, *Councilmania muris*, *C. decumani*, and *E. ratti* n. sp. A list is given of 39 references to the literature cited.

New nematodes from North American mammals, E. A. Chapin (*Jour. Agr. Research [U. S.], 30 (1925), No. 7, pp. 677–681, figs. 4*).—Four species of nematodes are here described as new, namely, *Dictyocaulus hadweni*, from the lungs, and *Ostertagia bisonis*, from the fourth stomach and duodenum of the North American buffalo, both at Wainwright, Alberta, and *Travassosius americanus*, from the stomach, and *Castorstrongylus castoris* (n. g.), from the colon of the North American beaver, both at Washington, D. C.

Review of the nematode genera Syngamus Sieb. and Cyathostoma E. Blanch, E. A. Chapin (*Jour. Agr. Research [U. S.], 30 (1925), No. 6, pp. 557–570, pls. 4*).—The author recognizes six apparently valid species of Syngamus, of which two are described as new. Two other species are considered doubtful. Seven species of Cyathostoma, apparently all valid, are described, of which two are new.

Cooperia bisonis, a new nematode from the buffalo, E. B. Cram (*Jour. Agr. Research [U. S.], 30 (1925), No. 6, pp. 571–573, figs. 7*).—Under the name *C. bisonis* the author describes a new nematode collected by S. Hadwen and A. E. Cameron during post-mortem examinations of buffalo at the National Buffalo Park, Wainwright, Alberta, in 1923, and which, through some lapsus, was designated by Cameron as *Haemonchus ostertagi*.[6]

Preliminary checklist of common names used in applied entomology, H. Morstatt (*Sup. Ent. [Deut. Ent. Inst.] No. 10 (1924), pp. 56*).—A compilation of common names of insects.

[Report of the] department of entomology, W. E. Hinds (*Louisiana Stas. Rpt. 1924, pp. 18, 19–30*).—A brief discussion of climatic conditions as affecting the boll weevil is first presented. In comparative tests conducted, lead arsenate was found to be fully as effective in weevil control as was calcium arsenate under the climatic conditions prevailing in 1924. With dusts applied on the same dates, plants dusted with calcium arsenate had far less visible evidence of dusting than those dusted with lead arsenate. Three applications of Hill's Mixture, made between July 23 and August 12, resulted in a yield of some 200 lbs. less than was obtained from adjoining plats dusted with calcium arsenate.

---

[6] Vet. Jour., 79 (1923), No. 580, pp. 331–336.

Reference is made to a series of toxicity tests conducted in field cages from August to November, in which some 36 materials or mixtures of materials were tested for periods ranging from 6 to 15 or more days after the dust application was made. Among the standard calcium arsenate dust applications, it appeared that treatments were 1.6 per cent more effective where applied to plants moist with dew than when plants were dry at the time of application. In applications made with day dust materials which contain a sticker, 15.9 per cent greater mortality resulted when applied to plants moist with dew than when applied to the dry plants. Dust mixtures containing 2 per cent actual nicotine or 5 per cent of nicotine sulfate containing 40 per cent of nicotine caused quite a high degree of mortality among the weevils for several days following the application, and such a dust containing no arsenate appeared to be nearly as effective in weevil control in cages as did straight calcium arsenate applications. The tests did not show any greatly increased toxicity for sirup mixtures over the straight dust applications in 24 hours' exposure of weevils thereto. In the entire series of tests, including all materials, there was an average of 4 per cent greater mortality when the applications were made to plants moist with dew than when made to plants that were dry. A homemade dust-mixing machine was devised which can be made in about 2 hours' time at an expense of less than 50 cts. for materials.

In hibernation cages, in which 7,326 weevils were started, hibernation in the field began about November 24 and was practically complete by December 1.

An account is given by W. G. Bradley of planting experiments for the control of the southern corn rootworm, officially known as the spotted cucumber beetle. In plantings made between March 3 and May 23, no injury was recorded until the planting of March 31, the maximum injury of 38.6 per cent having appeared in the planting of April 8. From April 8 the infestation decreased rapidly, no injury taking place after the planting of April 29. A brief reference is made to applications of various substances about young corn as a control measure, none proving of sufficient value to warrant further experimentation.

In planting experiments for the control of the corn ear worm and the sugar cane borer, a steady rise in infestation by borers took place up to the planting of May 8, after which it remained fairly constant. The corn earworm infestation proved fairly constant in all plantings except that of May 8, when it dropped to 58.6 per cent. But little difference was found in the relative attractiveness of sweet corn and field corn for the corn earworm and sugar cane borer.

[Report of the] entomological branch [Canada] (*Canada Min. Agr. Rpt., 1924, pp. 83–94*).—This is a brief report of the work of the year with insects.

Early references to Hawaiian entomology, J. F. Illingworth (*Bernice P. Bishop Mus. Bul. 2 (1923), pp. 63*).—This account includes an annotated bibliography of 225 titles, arranged chronologically, and alphabetical lists of the genera and species.

The control of cotton pests in north India, P. B. Richards (*Agr. Jour. India, 19 (1924), No. 6, pp. 568–578, pls. 2*).—This account deals particularly with control measures for three bollworms of the genus Earias and the pink bollworm.

Insects feeding on the hop, F. V. Theobald (*[Gt. Brit.] Min. Agr. and Fisheries, Misc. Pub. 42 (1925), pp. 59–82, pls. 15, figs. 2*).—An account of hop insects in Great Britain, of which the hop aphid, wireworms, and the red spider (*Tetranychus altheae*) are the most important.

Insects feeding on truck and garden crops, and how to control them, C. C. Compton (*Illinois Sta. Circ. 297 (1925), pp. 3–46, figs. 17*).—This is a practical summary of information.

[Cranberry insect investigations], H. J. Franklin (*Cape Cod Cranberry Growers' Assoc. Ann. Rpt., 36 (1923–24), pp. 4–7*).—This is a report of work carried on by the Massachusetts Station during 1922 and 1923, in continuation of that previously noted (E. S. R., 50, p. 659).

Tests have shown the root grub (*Amphicoma vulpina*) to be easily killed by a solution of 1 oz. of sodium cyanide in 20 gal. of water, soaked into the surface soil about May 1 at the rate of 1 gal. to the square foot. The yellow-head fireworm and the red-striped fireworm (*Gelechia trialbamaculella*) can both be controlled by killing the moths early in April with a spray consisting of 1 qt. of nicotine sulfate and 4 lbs. of fish oil soap in 100 gal. of water. A lead arsenate spray applied at the rate of 3 lbs. of the powder to 50 gal. of water about May 24 (the time and strength found to be most effective against the gipsy moth) also controls this pest well. The cranberry girdler moths can be destroyed with a spray of 20 lbs. of caustic potash fish oil soap in 100 gal. of water, at the rate of 800 gal. per acre if the vines are thick, using only one spray, but supplementing with two or three applications of nicotine sulfate and soap spray.

Parasitism of the eggs of the cranberry fruitworm by *Trichogramma minuta* in 1922 ranged from 0 to 20 per cent on dry bogs and from 0 to 29 pér cent on flowed bogs (only one over 17 per cent). In normal seasons this parasitism ranges from 36 to 80 per cent on dry bogs and from 7 to 55 per cent on flowed bogs, but in 1923 it ranged from 0 to 50 per cent on the flowed bogs and from 14 to 50 per cent on the dry ones.

Extensive spraying for control of the blackhead fireworm showed that lead arsenate applied about two days after the worms begin to hatch is a satisfactory treatment for the second brood. In 1922 a new species of Entomophthora was found to cause an epidemic among blackhead fireworms on one bog, which prevented practically all the worms of the second brood from pupating. An outbreak of the spotted cutworm during the summer of 1923 on 13 widely separated bogs, covering about 200 acres, resulted in a loss of 10,000 bbls., representing a monetary loss of $60,000. Observations show that the pest does not attack cranberry bogs unless the winter water is held later than May 20.

The principal agricultural pests of Jamaica, C. C. Gowdey (*Jamaica Dept. Agr., Ent. Bul. 2 (1923), pp. (3)+80+VI, pls. 7*).—This is a summary of information on the more important insect pests of the principal crops grown in Jamaica, stored grains, etc.

[Work with economic insects in Ohio] (*Ohio Sta. Bul. 382 (1924), pp. 8, 34–37, figs. 3*).—In work with the black peach aphid, which attacks the roots and destroys young trees after they are set in the orchard and also seedlings in the nursery row before they are budded, paradichlorobenzene showed the most promise of future development. The entire failure of tobacco dusts to control the pest is said to have been an outstanding feature of the experiments. Studies were also made of the life history of the aster root aphid (*Prociphilus (Trama) erigeronensis*), which overwinters in the nest of ants and not on the roots of its host plants. A solution of nicotine sulfate poured about the roots of the asters is said to be the best control measure. A formula consisting of nicotine sulfate 1 to 1.5 teaspoonfuls, soap (dissolved) 1 oz., and water 1 gal. is recommended.

In work with the San Jose scale, lime-sulfur spray is said to have given satisfactory results in Ohio when properly applied, and its use is recommended. Work with miscible oils and oil emulsions is under way.

In studies of the relation of infestation by the European corn borer and of yields to date of planting, nine varieties of dent and three of sweet corn were grown. The results indicate that late-planted crops of sweet corn or field corn can be grown without serious injury. In work with artificial control measures, the results thus far indicate that burning unused parts of the corn crop is probably the most efficient. Ensiling the crop, shredding the fodder, or otherwise disposing of the crop in such a way that the borers will be destroyed is recommended.

The Mexican bean beetle has continued its spread, and at the end of 1924 covered the entire State. It has been found feeding on all manner of beans, including soy beans and cowpeas, and on field and garden peas, the wild cucumber, and the common bindweed, where these were growing in the bean field. Several dusts combining insecticides have given effective control on all varieties of beans.

Entomogenous fungi and their use in controlling insect pests, T. Petch (*Ceylon Dept. Agr. Bul. 71 (1925), pp. 40, pls. 2*).—This is a practical summary of information.

The physics of spray liquids, I–III, R. M. Woodman (*Jour. Pomol. and Hort. Sci., 4 (1924), No. 1, pp. 38–58, figs. 6; 4 (1925), No. 2, pp. 78–103, figs. 3*).—The following three papers are presented: (1) The Properties of Wetting and Spreading (pp. 38–58), (2) The Protective Action of Various Substances on Lead Arsenate Suspensions (pp. 78–94), and (3) On the Ease of Formation of Emulsions (pp. 95–103).

Sodium fluosilicate as an insecticide, S. Marcovitch (*Indus. and Engin. Chem., 16 (1924), No. 12, p. 1249*).—This is a brief statement of results obtained at the Tennessee Experiment Station, the details of which have been noted from another source (E. S. R., 52, p. 555).

Further experiments with sodium fluosilicate as an insecticide, F. Tattersfield and C. T. Gimingham (*Indus. and Engin. Chem., 17 (1925), No. 3, p. 323*).—The account by Marcovitch noted above led the authors to present this brief record of preliminary tests made of the toxicity of sodium and potassium silicofluorides and other related stomach poisons used as sprays, by the department of insecticides and fungicides of the Rothamsted Experimental Station, England, during the summer of 1924. Tests were made with the larvae of *Selenia tetralunaria* Hufn., the results being in general agreement with those obtained by Marcovitch.

A monograph of Phyllophorinae [trans. title], H. H. Karny (*Treubia [Batavia], 5 (1924), Sup., pp. 142, pls. 4, figs. 40*).—A monographic account of this group of Orthoptera, prepared at the Buitenzorg Museum. Four genera are erected and 32 forms described as new.

The strawberry root louse in Tennessee, S. Marcovitch (*Jour. Agr. Research [U. S.], 30 (1925), No. 5, pp. 441–449, pls. 3*).—This contribution, from the Tennessee Experiment Station, reports upon studies of the life history, habits, and economic importance of *Aphis forbesi* Weed in Tennessee, the largest strawberry producing State in the Union. This aphid was found to be present wherever strawberries are grown in the State, the cultivated strawberry being its only host. A comparison made of the number of plants produced by infested and uninfested mother plants showed the difference to be so small that the pest can not be classed as highly injurious in Tennessee. This aphid has many natural enemies, one of the most important being the

syrphid *Paragus tibialis*. Reference is made to the studies by Sanderson at the Delaware Station in 1900 (E. S. R., 12, p. 970).

The vacuum-cyanide method of delousing clothing and baggage, H. E. Trimble (*Pub. Health Rpts.* [*U. S.*], *40* (*1925*), *No. 8, pp. 335–351, pls. 3*).—This paper presents experimental data upon which the procedure at the New York quarantine station is based. It is recommended that the use of hydrocyanic acid gas be continued for the delousing of clothing, using from 143 to 285.7 oz. of sodium cyanide per 1,000 cu. ft., or from 72 to 143 fluid ounces of liquid hydrocyanic acid, and that the initial vacuum be 26 in. and the exposure at least 30 minutes.

The Japanese beetle, J. S. Houser (*Ohio Sta. Mo. Bul., 10* (*1925*), *No. 3-4, pp. 44–49, figs. 6*).—A brief practical summary of information on this pest.

The Mexican bean beetle in North Carolina: Studies and tests for control, J. C. Crawford (*N. C. Dept. Agr. Bul., 1924, Nov., pp. 12, figs. 4*).—This is a summary of information on the Mexican bean beetle, which first invaded North Carolina in 1921, including life history studies made under mountain conditions at Bryson City. Three generations were observed during the year. The first oviposition by overwintering beetles was observed to take place on June 1 and the last on July 8. The incubation period was 6 or 7 days. The larval stage of the first generation averaged 22.5 days, of the second generation about 16.75 days, and of the third generation 17.75 days. The pupal stage of the first and third generations was about 6.5 days and of the second generation about 5.75 days. The overwintered generation averaged 547 eggs in 10 clusters, the first field-reared generation averaged 732 eggs in 14 clusters, the second generation 919 eggs in 16 clusters, and the third generation laid few or no eggs, the adults hibernating.

The author recommends the use of a dust consisting of calcium arsenate 1 part, sulfur 1 part, and hydrated lime 4 parts, or calcium arsenate 1 part and hydrated lime 9 parts.

The cherry leaf-beetle, R. H. Pettit (*Michigan Sta. Circ. 68* (*1925*), *pp. 2, fig. 1*).—A brief practical account of *Galerucella cavicollis* Lec.

Studies on the larvae of North American beetles of the subfamily Tenebrioninae with a description of the larva and pupa of Merinus laevis (Olivier), R. A. St. George (*U. S. Natl. Mus. Proc., 65* (*1924*), *Art. 1, pp. 22, pls. 4*).—A detailed account is given of larvae of the genera of this subfamily present in the National Collection.

The control of the destructive spruce bark beetle in eastern Canada, J. M. Swaine (*Canada Dept. Agr. Pamphlet 48, n. ser.* (*1924*), *pp. 28, pls. 7*).—It is pointed out that *Dendroctonus piceaperda* Hopk., officially known as the eastern spruce beetle, and the Alaska spruce beetle are the most dangerous and destructive insect enemies of mature spruce throughout the coniferous forests of Canada, excepting only the spruce budworm on red spruce in New Brunswick. Several recent outbreaks of the bark beetles have emphasized their importance and led to the investigations here reported. Following a brief introduction, accounts are given of the general appearance of an outbreak, the general habits and methods of attack, the seasonal history, the effect of fires on the course of the outbreak, infestation in fire-injured trees, natural control, artificial control, etc. Descriptions of several secondary species are included.

The distribution of the alfalfa weevil (Phytonomus posticus Gyll.): A study in physical ecology, W. C. Cook (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 5, pp. 479–491, figs. 12*).—This is a contribution from the Montana Experiment Station, in which the climatic factors influencing the distribution of the alfalfa weevil in the Old World and in the United States are dealt with.

It is pointed out that the limiting periods are two in number—the temperature limit, which applies largely to the hibernating adults, and the humidity limit, which applies to the larva and its fungus enemies.

The control of the apple blossom weevil (Anthonomus pomorum L., Curt.), A. M. MASSEE (*Jour. Pomol. and Hort. Sci., 4 (1924), No. 1, pp. 24–37, figs. 2*).—This is a report of control work conducted at the East Malling Research Station on a plantation of 7-year-old bush apple trees, commenced in 1921. The methods of control tested are dealt with under the headings of the value of hens as devourers of insects, the jarring of trees and subsequent trapping, the use of lime wash or arsenical spray in the spring just before the blossoms open, and the possibilities of various methods of trapping, such as banding.

A contribution toward the classification of the weevil larvae of the subfamily Calendrinae occurring in North America, R. T. COTTON (*U. S. Natl. Mus. Proc., 66 (1924), Art. 5, pp. 11, pls. 10*).—This paper deals with the generic characters of the subfamily Calendrinae, based upon a study of the larvae of all the genera of the subfamily found in North America with the exception of Trichischius, the larva of which is unknown, and Eucactophagus, which has not become established in this country.

Butterfly lore, H. ELTRINGHAM (*Oxford, Eng.: Clarendon Press; New York: Oxford Univ. Press [Amer. Branch], 1923, pp. 180, pl. 1, figs. 52*).—This semipopular account includes chapters on the eggs; caterpillars; chrysalids; structure; senses; scents; butterfly relations with ants; concealment, mimicry, and polymorphism; etc.

A survey of the silk industry of south China, C. W. HOWARD and K. P. BUSWELL (*Ling Nan Agr. Col., Canton Christian Col., Agr. Bul. 12 (1925), pp. [3]+208, pls. 6*).—This account deals with the history of sericulture in Kwangtung Province (pp. 4–11), the silk industry of south China (pp. 12–40), mulberry culture (pp. 41–65), the production of cocoons (pp. 66–111), cost of living for a silkworm farmer (pp. 112–115), preparation of raw silk (pp. 116–145), marketing the raw silk (pp. 146–150), waste silk and pierced cocoons (pp. 151–154), silk weaving in Kwangtung (pp. 155–159), wild silk in Kwangtung (pp. 160–162), possibilities of expansion (pp. 163–169), and recommendations for improving Kwangtung sericulture (pp. 170–185).

It is stated that *Porthesia similis*, a lymantriid lepidopteran, the spines of which are very irritating to the skin, and affect the silkworm if ingested, is the principal enemy of the mulberry plant in Kwangtung. The insect next in importance is the cerambycid *Aprion plicicollis*, which feeds on the bark of young mulberry twigs, causing them to break off and die. A large cricket, *Brachytrypes* sp., causes considerable damage where mulberry fields are located in sandy soil, through cutting off the young shoots as they grow from the mulberry crowns. Several leaf-eating caterpillars mentioned include the measuring worms *Hemerophila subplagiata* and *Boarnia* sp.; the leaf skeletonizers *Spodoptera mauritia* and *Homona menciana*, which eat the opening leaf buds; and the leaf roller *Glyphodes pyloalis*. Insects less frequently met with on the mulberry are *Prodenia litura*, *Arna plana*, *Pionea* sp., *Capira angustilineata* and *Euproctis irrorata*.

The diseases which attack Kwangtung silkworms (pp. 95–105) include pebrine, due to *Nosema bombycis*; flacherie; grasserie; muscardine; and the tachinid parasite *Tricholyga sorbillaria*.

The red-banded leaf-roller [Eulia velutinana Wlk.], H. E. HODGKISS and S. W. FROST (*Penn. State Col. Ext. Circ. 96 (1922), pp. 11, pls. 3, figs. 2*).—A summary of information on this leaf roller, which includes a diagram of its life history and two colored plates, one illustrating the common apple cater-

pillars *E. velutinana*, *Stenoma algidella* Wlk., *Ancylis nubeculana* Clem., and *Sparganothis idaeusalis* Wlk., the other the work of the red-banded leaf-roller on apples.

Some lepidopterous larvae resembling the European corn borer, W. O. ELLIS (*Jour. Agr. Research [U. S.], 30 (1925), No. 8, pp. 777–792, pls. 2*).—Twelve species of Lepidoptera are here considered, namely, *Pyrausta nubilalis* Hübn., *P. ainslici* Heinr., *P. penitalis* Grt., *Phlyctaenia rubigalis* Gn., *Diatraea zeacolella* Dyar, *Nomophila noctuella* D. & S., *Loxostege similalis* Gn., *Epiblema scudderiana* Clem., *E. strenuana* Wlk., *Depressaria heracliana* De G., *Heliothis obsoleta* Fab., and *Achatodes zeae* Har.

Relation between mortality of trees attacked by the spruce budworm (Cacoecia fumiferana Clem.) and previous growth, F. C. CRAIGHEAD (*Jour. Agr. Research [U. S.], 30 (1925), No. 6, pp. 541–555, figs. 5*).—The author's study here reported indicates that there is a definite correlation between the mortality occurring in spruce and fir stands from spruce budworm defoliation and the rate of growth of these stands prior to attack.

"The more rapid the rate of growth as expressed in diameter increment the lower the resulting mortality under equal conditions of feeding. This relation between the effects of budworm feeding and previous vigor is a more tangible quantity than any of the other factors heretofore considered, and should serve as a practical basis for preventive measures through proper silvicultural practices which maintain rapid growth. A comparison of the rate of growth of trees surviving budworm attack shows that the diameter growth for the 10-year period following the first year of feeding is only about one-half that of the preceding 10 years. It was found that in hardwood types the immunity of softwoods was proportional to the protection of the overstory of hardwood foliage. The percentage of mortality among dominant softwoods in mixed stands was as high as in pure softwood stands."

Studies on the spruce budworm (Cacoecia fumiferana Clem.), J. M. SWAINE, F. C. CRAIGHEAD, and I. W. BAILEY (*Canada Dept. Agr. Bul. 37, n. ser. (1924), pp. 91, pls. 25, figs. 6*).—In the first part (pp. 3–27) of this report of investigations of *C. fumiferana*, Swaine and Craighead give a general account of the outbreaks, injury, and associated insects. In the second part (pp. 28–88) the general bionomics and possibilities of prevention and control are dealt with by Craighead, with an article on the abnormalities of ring growth and cell structure, by Bailey (pp. 58–61). A colored plate illustrating several of the life stages of the budworm and a three-page list of references to the literature are included.

Identification of the larvae of the three common anopheline mosquitoes of the southern United States, P. F. RUSSELL (*Amer. Jour. Hyg., 5 (1925), No. 2, pp. 149–174, figs. 5*).—Instructions are given for the identification of the larvae of *Anopheles punctipennis* Say, *A. maculipennis* Meig., and *A. crucians* Wied. A bibliography of 42 references to the literature is included.

The boxwood leaf miner (Monarthropalpus buxi Labon), C. C. HAMILTON (*Maryland Sta. Bul. 272 (1925), pp. 143–170, figs. 22*).—This is a report of investigations of the boxwod leaf miner, including its life history, habits, and particularly control measures. The author finds that the adults usually emerge about the second week in May and oviposit at once. The incubation period averages about three weeks, the third larval instar being reached by fall, in which instar the winter is passed. The larvae molt into the fourth instar in March and pupate in April, and emergence of the adults has been observed in different years to take place in the vicinity of Baltimore from as early as April 22, in 1921, to as late as May 21, in 1920.

Experimental work extending over five years, many of the details of which are presented in tabular form, has shown that the boxwood leaf miner can be controlled cheaply and effectively, the best results having been obtained by spraying with a stock food molasses diluted 1 to 4 parts of water plus nicotine sulfate at the rate of 1 to 500 or 600 parts of the diluted spray material. The value of the molasses and nicotine spray was improved by covering the sprayed plants during rains with muslin or canvas covers. In laboratory tests the use of free nicotine did not give as good results as nicotine sulfate, probably because of the greater volatility of the free nicotine.

"The use of a heavy oil spray (Sunoco) diluted 1 to 20 parts of water plus Blackleaf 40 1 to 500 gave a good control of the midge. The oil spray was slightly more expensive than the molasses spray, and in the one experiment conducted caused considerable burning of the foliage. Other spray materials tested, principally pine tar creosote, molasses, and combinations of pyrethrum extract, tobacco dust, Derrisine, and Ace-Hy with molasses were either not effective in controlling the boxwood leaf miner or not economical when compared with the molasses and nicotine sulfate spray. Fumigation with hydrocyanic acid gas or carbon disulfide is not practicable, largely due to the difficulty and expense of application under field conditions and the injury resulting to the new growth from a concentration of the gas strong enough to kill the insects. The experimental work has demonstrated that it is absolutely necessary to keep the foliage thoroughly covered with the spray material during the entire time the adults are emerging. The emerging period is usually from two to three weeks, and the plants should be sprayed just previous to the beginning of emergence and usually twice more at intervals of five or six days. In case the molasses and nicotine are washed off by rains, the plants should be immediately sprayed again before the adults have time to emerge and lay eggs. The detrimental effects of rains in washing off the spray material may be partly prevented by covering the plants before rains with canvas or heavy muslin. . . . The first spray should be applied when the legs, wing pads, and antennae of the pupae begin to turn dark brown or black, or just before the adults start emerging. This is usually from May 10 to 15 for Baltimore, but may vary from the latter part of April to the latter part of May."

A monograph of the Helomyzidae [trans. title], L. Czerny (*Abhandl. Zool. Bot. Gesell. Wien, 15 (1924), No. 1, pp. 166, pl. 1*).—In this work on the dipterous family Helomyzidae the author recognizes 29 genera, of which 6 are erected, and 24 species are described as new.

A treatise on the law pertaining to the honeybee (*Madison, Wis.: Amer. Honey Prod. League, 1924, pp. 88*).—In this work chapters are devoted to property in bees and their produce (pp. 16–29), liability for transgression of rights in bees (pp. 30–32), liability for injuries by bees (pp. 33–39), and statutory regulations for the control of diseases (pp. 40–72).

Studies of the oviposition and method of feeding of Pteromalus variabilis Ratz. and Eurytoma appendigaster Dalm., chalcid parasites of Apanteles glomeratus L. [trans. title], J. C. Faure (*Rev. Zool. Agr. et Appl., 23 (1924), No. 10, pp. 225–233, figs. 2*).—A brief account of observations of the oviposition of these hyperparasites through the cocoon and of their feeding through the suction tubes formed. Mention is made of earlier observations of this habit in connection with a bibliography of 13 titles.

Parasitic Hymenoptera feeding by indirect suction, L. O. Howard (*Ent. News, 36 (1925), No. 5, pp. 129–133*).—A brief summary of the present status of knowledge of this method of feeding by the parasitic Hymenoptera, in

which particular attenton is given to the observations of J. C. Faure, above noted.

Two imported egg parasites of the gipsy moth, Anastatus bifasciatus Fonsc. and Schedius kuvanae Howard, S. S. CROSSMAN (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 7, pp. 643–675, figs. 11*).—This is a report of studies of two encyrtid egg parasites of the gipsy moth that have been imported from abroad and become established in America, namely, *A. bifasciatus*, which occurs in many parts of Europe and in Japan, and should now be able to parasitize at least 35 per cent of the gipsy moth eggs over a considerable portion of the infested area during the most favorable seasons, and *S. kuvanae*, a native of Japan, which, in the southern area, during favorable seasons, should parasitize from 30 to 40 per cent of the gipsy moth eggs.

"The biology of the two species varies greatly, Schedius having several generations and hibernating as an adult, while Anastatus has but one generation and hibernates as a full-fed larva within the egg of the gipsy moth. Both species are slow-spreading parasites, and considerable colonization work remains to be done before they will have the same distribution as the gipsy moth in the Northeastern States. Anastatus was established by liberating the imported parasites, and its colonization has been continued each year by collecing its host's eggs in New England and separating the parasitized eggs from those containing gipsy-moth larvae. A total of 54,345,193 Anastatus have been colonized. Schedius was established by breeding a relatively few adults received from Japan through several generations until enough adults of the parasite were obtained to warrant making liberations. It has been colonized in each succeeding year by breeding it through several generations at the laboratory, after having obtained the breeding stock from gipsy-moth eggs collected in New England. A total of 20,799,537 adult Schedius have been colonized."

Some new parasitic Hymenoptera with notes on several described forms, A. B. GAHAN (*U. S. Natl. Mus. Proc.*, *65* (*1924*), *Art. 4, pp. 23*).—Among the 11 new species here described are *Lecaniobius capitatus* and *Eupelmus coccidivorus*, both reared from a wax scale, *Ceroplastes* sp., collected at Las Sabanas, Panama; *Aphelinus sanborniae*, reared from *Sanbornia juniperi* Perg. at Spring Mills, Pa.; *A. jucundus*, reared from the potato aphid at Whittier, Calif.; *A. aureus*, reared from *Chaitophorus salicicola* Essig at Santa Paula, Calif., *A. perpallidus*, reared from an aphid on elm at Sioux City, Iowa; *Encarsia formosa*, parasitic on the greenhouse whitefly at Twin Falls, Idaho, Ann Arbor, Mich., Wooster, Ohio, and Washington, D. C.; *Eupteromalus cognatus*, reared from the egg capsules of spiders on Ballast Island, in Lake Erie, but more probably parasitic upon some dipterous or hymenopterous larva infesting the egg capsules; *Tetrastichus philodromi*, reared from the egg capsules of the arachnid *Philodromus canadensis* on South Bass Island, Ohio; *Baeus rotundiventris*, reared from a spider's nest on Middle Bass Island, Ohio; and *Phanurus promachivorus*, reared from eggs of the asilid fly *Promachus yesonicus* Bigot at Koiwai, Japan.

The leaf and bud mite of raspberry (Eriophyes gracilis Nal.), A. M. MASSEE (*Jour. Pomol. and Hort. Sci.*, *4* (*1924*), *No. 1, pp. 59–61, fig. 1*).—A description and brief account of the life history and habits of *E. gracilis*, first observed in buds of raspberries at the East Malling Research Station in 1922.

FOODS—HUMAN NUTRITION

A method for the preparation of basal dietary free from vitamin A, E. TSO (*Soc. Expt. Biol. and Med. Proc.*, *22* (*1925*), *pp. 265, 266, fig. 1*).—The method described depends upon the destruction of vitamin A by oxidation.

The apparatus includes "an iron coil of about 7 mm. bore, two suction flasks interposed between the coil and the compressed air faucet, one improvised Marshall and Kolls' flowmeter, a shower expansion of about 28 cm. diameter made of copper sheet, and a galvanized iron drum box inclosing the shower expansion."

About 200 gm. of the food to be treated is spread over a 26 cm. aluminum tray which is placed at a distance of 6 cm. under the shower plate. A 4-tube gas burner is placed under the coil and the air stream set in motion at a rate of about 3,000 liters per hour. For yeast the temperature is kept at about 110° C. and for casein and starch at about 120°. The treatment is continued for about six hours, the food being stirred at half-hour intervals.

This treatment is said to destroy vitamin A without injuring the food otherwise, and is recommended as less expensive and more rapid than the usual extraction method.

Composition of several varieties of Corsican olives [trans. title], P. SAJOUS (*Ann. Falsif., 17 (1924), No. 190, pp. 404–407*).—Data are reported on the composition of 16 samples of Corsican olives of several varieties, the determinations including the weight of the olives and pits, the percentage of pulp and pit, and the percentage of dry matter and oil in the pulp. The minimum and maximum figures for the oil were 25.03 and 50.05 per cent.

Cystine in the nutrition of the growing rat, H. C. SHERMAN and A. T. MERRILL (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 331–337, figs. 3*).—To determine whether cystine is a limiting factor in growth on a diet the protein of which is furnished by milk alone, young rats were placed at weaning on a basal diet of whole milk powder diluted with about five times its weight of starch, together with common salt and with yeast, butterfat, cystine, or ferric citrate as a supplement.

On the basal diet alone (cornstarch 81.97, whole milk powder 16.39, and sodium chloride 1.64 per cent) and on all the other diets except the one furnishing yeast, growth soon ceased, but was renewed after the addition of yeast, thus indicating vitamin B to be the first limiting factor. The subsequent growth was below normal in all of the rats except those receiving cystine, in which growth was rapid. In a second series, similar to the first except that 1 per cent of calcium carbonate was added to the rations, growth was again more rapid with the cystine. The calcium carbonate appeared to be without effect.

It is concluded that cystine is the first limiting amino acid of the proteins of cow's milk for the growth of young rats.

Metabolic studies in a case of prolonged uniform nutrition in man [trans. title], A. SORDELLI, B. A. HOUSSAY, P. MAZZOCCO, C. T. RIETTI, V. MORERA, and J. R. BELTRAN (*Compt. Rend. Soc. Biol. [Paris], 92 (1925), No. 10, pp. 829–831*).—Data are summarized from a metabolism study conducted for 51 days on a man aged 81 years who had lived for 19 years on a uniform diet of milk 750 cc., oatmeal (in the form of porridge) 400 gm., fat 65 gm., onions 120 gm., and tea, maté, or coffee ad libitum. The diet had been adopted on account of severe diabetes, which had been kept under control but not cured.

The percentage composition of the ration was carbohydrate 48, fat 38, and protein 14 per cent. Determinations of urinary nitrogen showed a utilization of 62 gm. of protein per day, corresponding to 0.115 gm. of nitrogen per kilogram of body weight. Twenty per cent of the nitrogen was eliminated in the feces. The nitrogen balance was +27 gm. during the period of observation. The mineral balance was also positive. On 13 gm. daily, 43 per cent was eliminated by the urine. The diet was high in calcium, almost 2 gm. per day, and very low in chlorides.

The basal metabolism was about normal, 33 calories per 100 kilograms per hour. This was increased from 34 to 39 per cent by eating, and from 66 to 132 calories by mechanical work consisting of lifting a weight of 5 kg. from 14 to 16 times a minute.

Physical fitness for orphans: A demonstration, W. R. P. Emerson (*Jour. Amer. Med. Assoc., 84 (1925), No. 18, pp. 1327-1329*).—The value of paying attention to physical as well as mental fitness in institutions for the care of orphans is shown by this report of a systematic attempt by a proper nutrition program to improve the physical condition of children in 14 orphan institutions in various parts of the country. In these institutions, containing from 50 to 300 children each, it was found that from 30 to 50 per cent of the children were 7 per cent or more underweight for height and from 50 to 67 per cent were below the average weight for height. Data are given showing that by the adoption of a satisfactory nutrition program the children were brought to a state of normal physical fitness within periods of from 3 to 12 months.

On feeding in public schools, G. E. Friend (*Sci. Prog. [London], 19 (1925), No. 76, pp. 643-654*).—This is a nontechnical discussion of various aspects of institutional feeding, particularly as applied to the English public schools.

Further experiments on the influence of the parents' diet upon the young.—III, The influence upon the young of an excessive amount of calcium in the mother's diet during pregnancy, V. Korenchevsky and M. Carr (*Biochem. Jour., 19 (1925), No. 1, pp. 112-116*).—This paper supplements and modifies to a certain extent some of the conclusions drawn in the previous paper of the series (E. S. R., 53, p. 262). The present discussion is based upon a comparison of the data reported in an earlier paper (E. S. R., 50, p. 261) with those of the previous paper. This comparison shows a difference between the power of cod liver oil and butter to enable young rats to utilize an excess of calcium present in the mother's diet during pregnancy. When the mother's diet was enriched with cod liver oil and calcium, there was a marked decrease in nutritional disorders and rachitic changes in the young on a diet deficient in fat-soluble vitamins even when the mother was kept on the deficient diet during lactation, but this was not true when butter was used in place of cod liver oil. It is not known whether this difference is of a quantitative or qualitative nature.

"Provided that the mother rats' diet during pregnancy is complete in every respect and that the fat-soluble factor is present in the form of cod liver oil, an ample amount of calcium in the maternal diet is of great importance for the young kept after weaning on the above deficient diet."

The extraction of a parathyroid hormone which will prevent or control parathyroid tetany and which regulates the level of blood calcium, J. B. Collip (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 395-438, figs. 2*).—In this communication, data are presented showing that tetany in parathyroidectomized dogs can be prevented and controlled by a special extract of the parathyroid glands of the ox.

The extract is prepared by hydrolyzing the fresh or frozen glands with 5 per cent of hydrochloric acid, rendering the hydrolysate alkaline to pH 8 by sodium hyroxide, adding hydrochloric acid slowly until a maximum precipitation of proteins and protein derivatives occurs, and removing the precipitate by centrifuging or filtering. The aqueous extract thus prepared can be administered by ingestion or by subcutaneous or intravenous injection.

Coincident with the improvement of symptoms following the use of the active extract, a rise in blood calcium has been noted. With large doses of the extract, symptoms of hypercalcemia (anorexia, vomiting, apathy, drowsiness

verging into coma, and failing circulation) appear, and if allowed to persist end fatally. Sodium carbonate can be used to reduce the calcium content of the blood serum in hypercalcemia. The extract is effective in preventing or controlling tetany in dogs receiving no preoperative preparation and which have been placed on a heavy meat diet immediately following recovery from the operation.

The effect of a parathyroid hormone on normal animals, J. B. COLLIP, E. P. CLARK, and J. W. SCOTT (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 439–460, figs. 13*).—This paper supplements the one noted above by the report of a similar study of the effect of the parathyroid hormone upon normal dogs.

A single injection of the extract brings about changes in the blood calcium similar to those produced in the parathyroidectomized animal—a gradual rise to a maximum in from 5 to 9 hours, followed by a similar decrease to normal. The initial rise in normal animals is not so great as in parathyroidectomized animals, and the return to normal is less prolonged. With repeated injections a cumulative effect results. When the value reaches 15 mg. of calcium per 100 cc., definite symptoms of hypercalcemia develop, accompanied in the terminal stage by at least 100 per cent increase in the viscosity of the blood but no great change in hemoglobin values. The physiological effect appears to be more dependent upon the time interval between the injections than upon the size of the dose.

In a few cases of the administration of the extract to human beings, the minimal effective dose was found to be about one-third to one-half an ox gland.

A few studies on the blood chemistry at death following hypercalcemia are summarized. The data thus far obtained indicate a gradual fall in defibrinated blood halogen and in cryoscopic readings, an increase in urea nitrogen, nonprotein nitrogen, and in viscosity, and no significant changes in blood sugar and in the alkaline reserve until just before death, when a marked drop occurs in the latter.

Mineral deficiencies of milk as shown by growth and fertility of white rats, A. L. DANIELS and M. K. HUTTON (*Jour. Biol. Chem., 63 (1925), No. 1, pp. 143–156, figs. 2*).—This is the complete report of a long-continued investigation of the nutritive value of milk, the outcome of an earlier study on the deficiencies of heated milk (E. S. R., 44, p. 860). The general plan of the investigation was to supplement milk with various organic and inorganic substances and to carry on feeding experiments with rats through several generations if possible, noting the number and viability of the young.

Of the many substances tested, soy bean powder or its ash was the first to correct the deficiency in the milk with respect to reproduction. With the addition of from 7 to 10 gm. of the powder to 1 liter of milk, young in the first generation were obtained at 13 weeks and succeeding litters were successfully raised. Equally good results were secured by the addition to quickly boiled milk of starch paste containing a mixture of aluminum potassium sulfate ($AlK(SO_4)_2 12 H_2O$), sodium fluoride (NaF), sodium silicate (Na_2SiO_3), and manganese sulfate ($MnSO_4 4H_2O$) in such a proportion that each animal received daily 1.5 mg. of each salt. To every 200 cc. of milk 1 drop of a 2 per cent solution of sodium iodide and 3 drops of a saturated solution of iron citrate were also added. The salts when used alone or in combinations of 2 and 3 were less effective than the mixture of salts, and the addition of all of them to a purified ration made to simulate milk was without effect on reproduction.

It is concluded that if vitamin X is essential to physiological processes it is contained in milk in sufficient quantity for growth and reproduction, and that the deficiencies in milk are rather of a mineral nature.

Reproductive potency of dry milk as affected by oxidation, G. C. SUPPLEE and O. D. DOW (*Jour. Biol. Chem., 63 (1925), No. 1, pp. 103–114, figs. 5*).—Milk powder containing 12 per cent of fat was packed in hermetically sealed cans (1) containing air, (2) containing carbon dioxide, and (3) containing a deoxygenated substance, and after nearly two years was used in feeding experiments with rats as part of a ration consisting of casein 18, salt mixture 4, agar 2, yeast 3 per cent, and dextrin to make up 100 per cent with the varying proportions of the milk powder which furnished 11.7, 17.5, 23.3, and 35 per cent of the ration. These amounts were equivalent to 1.4, 2.1, 2.8, and 4.2 per cent of butterfat.

With the rats fed the air-packed or CO_2-packed powders there was no reproduction on any of the amounts of milk powder fed. With the powder stored in deoxygenated air there was one instance of reproduction on amounts as low as 11.7 per cent, slightly better on the intermediate amounts, and normal reproduction and rearing through the weaning period on the largest amount. Of the same kind of milk powder stored under ordinary conditions for about 7 months, 41.7 per cent was required to duplicate the results obtained with 35 per cent of milk powder held for two years in deoxygenated air. This amount had a butterfat equivalent of 4.2 per cent. When butterfat prepared under ordinary conditions was used in place of the butterfat of the dried milk, young were produced and reared on 5 per cent butterfat, but the young were not vigorous. On 2 per cent of cod liver oil there was no reproduction.

"The data recorded in this preliminary report do not permit definite statements regarding all prerequisites necessary for successful reproduction. The interpertation of the results can not be construed as tending to disprove the existence of a distinct reproductive factor X, nor, in the light of present knowledge, do they necessarily tend to corroborate the existence of such a factor. If further investigations should prove beyond doubt the existence of a distinct vitamin necessary for reproduction, it is apparent from our data that this factor is readily susceptible to oxidation in the condition in which it exists in dry milk. On the other hand, if the destructive oxidative changes should prove to have been limited merely to the quantitative reduction in potency of vitamin A, it would appear that the marginal requirements of this vitamin necessary for successful reproduction are greater than heretofore appreciated."

Dietary requirements for reproduction.—IV, Solubility of the reproductive dietary complex (vitamin E) in various organic solvents, B. SURE (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 211–223, figs. 10*).—In this continuation of the investigation previously noted (E. S. R., 53, p. 62), evidence is presented that the factor E, which is essential for reproduction, is soluble in benzene and acetone as well as ether.

In feeding experiments in which wheat embryo from which the greater part of the oil had been removed by extraction with acetone or benzene was used as a source of vitamin E, fertility was secured but the young were not reared, showing that the extracted embryo was insufficient for lactation. The success in fertility is attributed to the small amount of residual oil left in the embryo after extraction. In this connection attention is called to the work of Mattill, Carman, and Clayton (E. S. R., 52, p. 864) in which failure at reproduction was secured with wheat embryo extracted for from 24 to 36 hours with anhydrous ether and to previous work of Evans (E. S. R., 52, p. 464) in which the conclusion was drawn that fat-free embryo is as effective a galactogogue as whole wheat embryo. It is considered probable that in the former case the wheat embryo had been more completely freed from oil than in the latter, and that the difference in results is due to traces of oil.

The knowledge of vitamins.—III, The vitamin content of beer [trans. title], A. SCHEUNERT and M. SCHIEBLICH (*Chem. Zelle u. Gewebe, 12 (1924), No. 1, pp. 45–56, figs. 4*).—In this continuation of the vitamin studies previously noted (E. S. R., 52, p. 64), the presence of vitamins in dark and light beer was tested.

Vitamins A and C could not be detected in either variety of beer. The growth-promoting vitamin B as tested on rats was present in traces only in the light beer and to a slightly greater extent in the dark beer. Growth was not fully normal, however, on an amount of beer equivalent to 5 liters per 60 kg. The antineuritic vitamin as determined by pigeon experiments could not be detected in the light beer and only in the smallest traces in the dark beer.

Composition of the diet and vitamin B [trans. title], C. FUNK, J. A. COLLAZO, and J. KACZMAREK (*Compt. Rend. Soc. Biol. [Paris], 92 (1925), No. 12, pp. 997, 998*).—By experiments similar to ones previously noted (E. S. R., 48, p. 558), it is considered to be demonstrated that the metabolism of proteins requires less vitamin B than that of carbohydrates.

Influence of fertilizers on nutritive value of wheat (*Ohio Sta. Bul. 382 (1924), pp. 56, 57*).—The results of feeding tests with rats and pigeons show that those plats receiving phosphates alone or in complete fertilizers produced wheat of the highest vitamin B content. This was indicated by the smallest number of grains required to prevent polyneuritis in pigeons, and the greatest number of cases of reproduction and rearing of young among the rats. The lowest amounts of vitamin B were found in wheats grown on plats receiving nitrate of soda or muriate of potash, or both. Plats receiving no fertilizer seemed to contain a higher vitamin B content than those receiving nitrate of soda, muriate of potash, or both. No perceptible difference was noted between the wheats from the limed and unlimed soils. This work is being continued.

The rôle of vitamine B in relation to the size of growing rats, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 233–238, figs. 2*).—The authors' previous conclusions concerning the quantitative relation of the vitamin B requirement to the size of the animal (E. S. R., 49, p. 62) have been confirmed with the vitamin B concentrate prepared from yeast by the method of Osborne and Wakeman (E. S. R., 42, p. 314).

The experiment was started with groups of rats weighing 50, 80, 150, and 250 gm., respectively. Four series were run in which the yeast concentrate serving as the sole source of vitamin B was fed apart from the basal ration in amounts of 40, 30, 20, and 10 mg. daily. The first dosage was near the minimum for growth for the largest rats and the last for the smallest. With decreasing amounts of the yeast the maximum weights reached by the animals decreased, and with the smallest amount of yeast decline in weight took place in the larger animals.

From the results obtained, the minimum effective dose of the yeast concentrate to produce growth at approximately the normal rate is estimated to be from 15 to 20 mg. per 100 gm. of body weight in contrast with 50 mg. of the yeast itself.

Vitamins in canned foods.—II, The vitamin C destructive factor in apples, E. F. KOHMAN, W. H. EDDY, and V. CARLSSON (*Indus. and Engin. Chem., 16 (1924), No. 12, pp. 1261–1263, figs. 4*).—Continuing the studies previously noted (E. S. R., 51, p. 462), tests were made of the content of vitamin C in cooked and canned apples. The methods of canning were similar to those used in experiments of Kohman and Sanborn on the nature of the corrosion of canned fruits (E. S. R., 51, p. 766). The first lot was held in 2 per

cent salt solution over night, the second given the same treatment with steaming before being packed in the cans, the third was packed in cans exhausted with nitrogen, the fourth packed in water heated to 70° C., and the fifth in cans exhausted with oxygen. The packing was done in No. 2 cans in all cases and the processing carried on at 100° for 5, 10, and 30 minutes.

In the first series of experiments Albemarle Pippin apples taken from storage were used. In control experiments with raw apples, the amounts fed were 10, 12, and 15 gm. every other day. On these amounts all of the guinea pigs lost weight very rapidly. After 20 days fresh apples were substituted for the cold storage apples with decided improvement, but the amounts fed did not furnish sufficient vitamin C for the prevention of scurvy. Of the various cooked and canned apples, the best results, as measured by the survival periods of the guinea pigs, were secured with the apples of the first two lots. On amounts equivalent to 10 gm. of raw apple, the average survival period with apple sauce was from 24 to 26 days, baked apples 28, apples canned in oxygen-filled cans 30.6, in water 24.6, in nitrogen-filled cans 26, salt-treated apples 56.6, and salt-treated followed by steaming 46 days, respectively.

A second series of experiments was carried out, using fresh Stayman Winesap apples. Three methods of canning were used, the first, third, and fourth in the above list. Some of the apples were placed in cold storage and tested raw from time to time. Of the fresh apples, 15 gm. proved insufficient to protect from scurvy. Of the canned apples, protection from scurvy was secured with the apples in the nitrogen exhausted cans when fed ad libitum and with the salt-treated apples when fed in amounts equivalent to 20 gm. of fresh apples. Of the apples kept in cold storage from October to March, from 40 to 41 gm. was required to produce the same effect as 20 gm. of the salt-treated canned apples.

These data would indicate that apples canned after treatment with salt solution, as is common practice in the commercial canning of apples, do not lose their vitamin C irrespective of the time of processing within the limits of commercial practice, and that such canned apples are richer in vitamin C than fresh apples which have been held for some time in cold storage.

The influence of storage on the antiscurvy value of fruits and vegetable juices, E. M. Delf (*Biochem. Jour., 19 (1925), No. 1, pp. 141–152, figs. 2*).—This is the complete report of an investigation which has been noted from a preliminary report by Davey (E. S. R., 45, p. 869). The earlier results with fresh fruits and fruit juices stored for a considerable period of time are again reported, together with the results obtained with the same materials after storage for about 5 years. The investigations also extended to swede juice.

The whole fruits (oranges and lemons) and the swede roots appeared to retain their antiscorbutic value when kept in cold storage as long as the material remained in good condition. Orange and lemon juices stored for 5 years in a frozen condition retained about half of their original antiscorbutic property, but swede juice became almost inactive after 15 months. Oranges canned by heating gradually to 100° C. and holding at this temperature for 5 minutes, the whole process occupying from 20 to 30 minutes, showed no loss of antiscorbutic property when first canned and only a slight decrease in activity after 4 years. As compared with raw juice stored in the frozen condition, storage at laboratory temperature after canning as above appeared to be a more efficient means of protecting the antiscorbutic value. Tomato juice canned as noted in a previous paper (E. S. R., 52, p. 863) was less stable than canned oranges.

Lemon juice preserved with potassium bisulfite retained its flavor well after storage for 4½ years at laboratory temperature, but during this period lost

about five-sixths of its antiscorbutic value. Orange and lemon juices preserved in rind oil retained their activity after from 1 to 3 years.

Irradiated foods and irradiated organic compounds: Therapeutic possibilities, H. STEENBOCK and A. L. DANIELS (*Jour. Amer. Med. Assoc., 84 (1925), No. 15, pp. 1093–1097, figs. 2*).—In addition to a concise summary, with references to the original literature, of previous work on the impartation of antirachitic properties to foods and certain chemical compounds by irradiation, data are reported on the calcium balances in two infants following the addition to their ordinary diet of 5 cc. daily of olive oil at first untreated and later irradiated for 30 minutes. In the first subject the calcium retention increased from 0.047 gm. per kilogram daily on the untreated oil to 0.061 gm. on the treated oil and in the second from 0.059 to 0.065 gm. The effect of the irradiated oil is said to be of the same order as that resulting from the use of cod liver oil.

Substances listed as giving positive results on irradiation are wheat, rolled oats, corn, hominy, Cream of Wheat, Shredded Wheat Biscuits, corn flakes, patent wheat flour, cornstarch, meat, milk, and egg yolk. "That such a wide variety of foods can be thus affected appears to be due to the fact that practically all naturally occurring foods contain lipoidal constituents of the nature of sterols which can carry this activation."

A further report on imparting antirachitic properties to inert substances by ultraviolet irradiation, A. F. HESS and M. WEINSTOCK (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 297–304*).—An extension of the authors' previous studies on the activation of inert substances with respect to antirachitic properties (E. S. R., 52, pp. 762, 763) is reported with the following results:

Irradiated green wheat tested after storage at room temperature for 2 weeks and irradiated green lettuce tested after storage for 3 days were found to have lost none of their antirachitic properties. Of various other substances tested for activation by irradiation, positive results were obtained with etiolated yellow wheat, etiolated yellow lettuce leaves, and refined wheat flour, and negative with chlorophyll, red blood cells, cream, the phosphatide of egg yolk, and glycerol.

An extension of the work with linseed oil showed that when irradiated it retained its protective power for at least 6 months, and that the period of irradiation could be reduced to 2 minutes with the mercury vapor lamp set at a distance of 1 ft. and operated at 76 volts. Linseed oil irradiated in a tube in which the oxygen had been replaced with nitrogen also acquired antirachitic properties. The active constituent of the irradiated oil was found to be present only in the unsaponifiable fraction.

The antirachitic value of irradiated phytosterol and cholesterol, I, A. F. HESS, M. WEINSTOCK, and F. D. HELMAN (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 305–308*).—Phytosterol prepared from the unsaponifiable matter of cottonseed oil and rendered as pure as possible by numerous recrystallizations was irradiated in a 1 per cent suspension in water for ½ hour at a distance of 1 ft. and then fed in 0.25-cc. amounts to rats on a low phosphorus diet, with complete protection against rickets. Similar results were obtained with cholesterol from brain tissue. Of the irradiated cholesterol, the amount required to secure protection was about $\frac{1}{150}$ per cent of the entire daily ration. Irradiated lanolin was found to have a slight degree of protective power.

It is considered of significance not only that a well-defined chemical substance can be rendered antirachitic by irradiation, but that in this case the substance should be cholesterol, a normal constituent of the deeper layers of the skin. The significance of cholesterol in the ordinary protection of animals against rickets by exposure to light is suggested.

The ultraviolet rays of the sun, A. F. HESS (*Jour. Amer. Med. Assoc., 84 (1925), No. 14, pp. 1033–1037, figs. 5*).—In this analysis of the biological activity of the sun's rays, a comparison has been made of the seasonal incidence of rickets in certain localities with the amount of actual sunshine during the same seasons and in the same places. Charts are also given of the seasonal and diurnal variations in the ultraviolet light in the sun.

It is shown that the amount of radiation in what is called "the antirachitic region of the solar spectrum" is very small during the winter months, that there is no close parallelism between the incidence of rickets and the yearly amount of actual sunshine, and that the occurrence of rickets does not depend upon an equable distribution of sunshine throughout the year. The determining factor is shown to be not the quantity of the sun's rays but the quality, i. e., the amount and intensity of the short ultraviolet rays. Since the quality of the sun's rays is very poor during the winter months, it is considered doubtful if much is to be gained by the use of quartz panes in place of ordinary window glass in nurseries, but that resort must be made during the winter months to ultraviolet light from artificial sources, or the use of cod liver oil or potent extracts of this oil, or foods that have been activated by irradiation as noted in the above paper.

It is suggested in addition that something can be accomplished in increasing the value of milk by the action of sunlight on the cow and on the fodder which it consumes. In this connection attention is called to a recent report by Luce (E. S. R., 52, p. 277).

A simplified method of dietary management of diabetes mellitus, J. D. BOYD, E. WHITTAKER, and E. MAGERS (*Iowa Univ. Studies Med., 2 (1924), No. 4, pp. 28*).—The system upon which the menus presented in this pamphlet are based is a formula providing 60 gm. of carbohydrate, 60 gm. of protein, and 150 gm. of fat, the whole yielding 1,830 calories, with a glucose-fatty acid ratio of 1:1.5. One-twelfth of this formula has been used as a unit, and numerous menus have been calculated, each representing 5 gm. of carbohydrate, 5 gm. of protein, and 12.5 gm. of fat divided into three equal and interchangeable meals. From these unit weights a diet of any desired calorific value may be calculated by multiplying the unit values by the proper factor. In the tables presented this has been done for unit values from 1 to 12.

Four series of menus based on this formula are presented. Group A is highest in cellulose, group B intermediate, and group C low in cellulose. Group D is made up entirely of liquids. For use when a 1:2 glucose-fatty acid ratio is required, a supplementary table is given, indicating the amount of fat to be added for each meal.

Simple directions are given for weighing and preparing the diabetic diets and for using the various menus.

The use of intarvin in diabetes mellitus, D. M. LYON, W. ROBSON, and A. C. WHITE (*Brit. Med. Jour., No. 3344 (1925), pp. 207–210*).—This investigation of the value of intarvin in diabetic diets comprises studies of the effect of the absorption of intarvin on blood fat, blood sugar, and the respiratory quotient in two normal subjects, and of the relationship of intarvin to metabolism in four diabetic subjects whose diets had been previously stabilized at the highest possible level within the limits of tolerance.

In the normal subjects the ingestion of 100 gm. of intarvin was followed by a rise in blood fat and blood sugar but no change in the respiratory quotient. In the diabetic subjects the ingestion of intarvin was followed by an increase in the percentage of acetone in the blood and in the total excretion of acetone. These were, however, not so marked as when an equivalent amount of other fat was given. The respiratory quotient did not indicate the

burning of an additional amount of carbohydrate, and small traces of sugar were excreted in the urine.

The authors conclude that "when a patient's diet has been stabilized at his maximum tolerance 100 gm. of intarvin can be added (allowing about 700 extra calories) without the appearance of clinical signs of acidosis. But, in view of the conflicting figures obtained regarding the control of ketosis consequent on its use, intarvin can not be used indiscriminately to build up diets to a maintenance level without fear of ketosis. The expense and the unpalatability of the substance will also militate against its general acceptance in practical dietetics."

Dietary control of nephritis, M. Koehne (*Jour. Amer. Med. Assoc., 84 (1925), No. 15, pp. 1103–1106*).—In this paper the author emphasizes a point that is often overlooked in special diets for pathological conditions such as nephritis, gastric and duodenal ulcers, diabetes, etc., namely, that it is quite as essential for the sick as the well person that the diet be adequate from the standpoint of the modern principles of nutrition, particularly as regards quality of protein, sufficiency of calcium, iron, and other inorganic elements, and an abundant supply of vitamins. With this in mind, present knowledge concerning the treatment of nephritis is outlined with reference to the dietary measures involved, the dietary limitations are discussed, and a general plan of dietary control is presented.

In this plan the classification of foods is based on one recommended by O'Hare and Vickers,[7] but the foods selected have been changed somewhat and rearranged to give proper consideration to the factors noted above. The foods listed are placed in six groups. In Group 1 A the foods listed are acid-forming and furnish proteins of inferior quality. In Group 1 B the proteins are also of inferior quality, but the foods are base-forming. In Groups 2 A and B the proteins are of excellent quality, but in Group 2 A the foods are strongly acid-forming and in Group 2 B are basic in reaction and are rich in calcium and in vitamins. In Group 3 the foods are basic and rich in vitamins and contain little protein. Group 4 is composed of carbohydrates and fats.

In the groups comprised of protein-containing foods, amounts are given representing either 4 or 8 gm. of protein per portion, these portions counting one and two points. The number of points from any one group which can be safely used for a given total number of points is stated in each case, thus making the selection of foods for a particular diet a comparatively easy matter. Two sample diets are included.

ANIMAL PRODUCTION

The American Society of Animal Production.—Record of the proceedings of annual meeting, December, 1923 (*Amer. Soc. Anim. Prod. Proc. 1923, pp. 182, figs. 11*).—This is the usual report of the annual meeting of the American Society of Animal Production held at Chicago in December, 1923 (E. S. R., 49, p. 863). The following papers were presented:

President's Address, by F. G. King (pp. 7, 8); Velvet Beans in the Ration of Brood Sows, by E. R. Miller and W. D. Salmon (pp. 9–12); Protein Supplements with Different Roughages for Fattening Cattle, by C. C. Culbertson, J. M. Evvard, W. E. Hammond, and Q. W. Wallace (pp. 13–24); Vitamin B in Meat and Eggs, by R. Hoagland (pp. 25–27); The Relation of Age and Weight of Swine to Gains in Nutrients, by A. G. Hogan (pp. 28–31);

[7] Jour. Amer. Med. Assoc., 81 (1923), No. 19, pp. 1606, 1607.

Some Effects of the Ingestion of Colostrum by the Newborn Calf, by P. E. Howe (pp. 32, 33); The Vitamin Content of Fish Meal, Tankage, and Blood Meal, by G. Bohstedt, C. H. Hunt, A. R. Winter, and R. C. Miller (pp. 34–36); Disease in Cattle Caused by Feeding Sweet-clover Hay, by C. P. Fitch (pp. 37–41); What Are the Possibilities of Genetic Contributions to the Field of Animal Production? by L. J. Cole (pp. 42–49); A Mendelian Analysis of Shorthorn Pedigrees-Bates Duchesses, by S. Wright (p. 49); A Dimension-weight Index for Cattle, by W. W. Yapp (pp. 50–56); The Register of Performance for Swine, by T. U. Ellinger and J. M. Evvard (pp. 57–61); The Net Energy Conception and the Newer Knowledge of Nutrition, by E. B. Forbes (pp. 62, 63); Mineral Mixture as a Supplement in Hogging Down Corn, by E. J. Wilford (pp. 64–67); Effect of Abrupt Changes in Diet upon the Yield and Composition of Milk, by C. A. Cary (pp. 68–70); The Comparative Feed Requirements and Rate and Cost of Gains of Fall and Spring Farrowed Pigs, by E. F. Ferrin and M. A. McCarty (pp. 71–74); Economical Rations for Dairy Calves, by R. S. Hulce, F. B. Morrison, and G. C. Humphrey (pp. 75–78); The Influence of Winter Rations upon Summer Gains on Short Grass, by C. W. McCampbell (pp. 79–81); The Relation of the "Meat Ring" and Farm Meat Demonstrations to Animal Production, by C. W. McDonald (pp. 82–84); Effects of Different Amounts of Protein on the Growth of Beef Calves, by F. W. Christensen (pp. 85–87); Soybean Hay for the Breeding Ewes, by J. M. Evvard et al. (pp. 88–93); On the Effect of Fowler's Solution for Fitting Livestock, by E. Roberts (pp. 94–98); The Relation of Farm Animals to Proper Ventilation of Barns, by M. A. R. Kelley (pp. 99–102); Increasing the Efficiency of Swine Rations, by F. B. Morrison (p. 103); Undernutrition in Steers, by F. G. Benedict (pp. 104–107); Marginal Production of Livestock, by E. N. Wentworth (pp. 108–112); Relation of Our Present Knowledge of Genetics to Breeding Practices, by C. F. Curtiss (pp. 113–115); Measuring a Teacher's Ability to Teach, by G. H. True (pp. 116–121); What the Agricultural Press Expects from the Livestock Worker, by C. E. Snyder (pp. 122–125); Desirable Factors in Animal Husbandry Instruction, by C. S. Plumb (pp. 126–131); An Analysis of the Results of the Steer Carcass Contest at the International Livestock Exposition, 1908–1923, by C. H. Maxwell, jr. (pp. 132–135); Observations on the Vitamin A Requirement of Swine: A Comparison of White Corn Rations for Growth and for Fattening, by A. R. Lamb and J. M. Evvard (pp. 136–141); Sheep Projects in the Corn Belt States, by R. L. Waddell (pp. 142, 143); The Place of the Animal Husbandry Specialists in a Marketing Program, by H. C. Ramsower (pp. 143–147); Teaching Swine Production through the Ton Litter Club, by J. W. Wuichet (pp. 148–151); What is the Job of a Horse Specialist? by J. M. Vial (pp. 151–153); The Extension Horseman's Job, by R. B. Cooley (pp. 153–156); Robert Burns Ogilvie, by J. L. Tormey (pp. 156–161); Phases of Animal Husbandry Education, by E. N. Wentworth (pp. 161–164); Professor Plumb as a Teacher, by C. W. Gay (pp. 164–166); and an address by C. S. Plumb (pp. 166–171).

[**Hydrocyanic acid content of millets and sorghums**], J. C. BRUNNICH (*Queensland Dept. Agr. and Stock, Ann. Rpt., 1923–24, pp. 31, 32, 33*).—The composition of various millets and sorghums is reported, as well as the content of hydrocyanic acid in these plants at various stages of growth. Ragi millet was the only millet containing this toxin and that only in small amounts. There was much variation in the HCN content of sorghums cut at three weeks of age, but later cuttings usually showed greatly reduced amounts. The young growth of second cuttings again showed high HCN content.

Loss of juice from silage (*Ohio Sta. Bul. 382 (1924), p. 45*).—In continuing the silage investigations (E. S. R., 50, p. 572), a study of the cause of loss of juice has indicated that the loss was less in more mature corn. The dry matter content of corn cut at the early silk stage was only 16.7 per cent, and the loss would easily amount to 40 or 50 per cent of the green weight. Wilting also tended to reduce the loss of juice, while pressure as obtained at the bottom of the silo increased the loss. Cutting corn fine resulted in a more compact silage which increased the loss of juice, though the more mature corn kept better when finely cut.

The feeding value of some unusual commercial feeds, J. G. Archibald (*Massachusetts Sta. Bul. 216, pop. ed. (1923), pp. 7, figs. 8*).—A popular account of the experiments previously noted (E. S. R., 50, p. 168).

Commercial feeding stuffs (*Oreg. Dairy and Food Commr., Com. Feeding Stuffs Bul. 2 (1924), pp. 79*).—This includes a copy of the Oregon feeding stuffs law, with definitions, and a tabulated list of the feeds analyzed during the calendar year 1923, with their guaranteed analyses.

Studies of the thyroid apparatus.—XXVIII, The differential development of the albino rat from 75 to 150 days of age and the influence of thyro-parathyroidectomy and parathyroidectomy thereon, F. S. Hammett (*Amer. Jour. Physiol., 70 (1924), No. 2, pp. 259–272*).—In this study the growth of the several organs is recorded for control and thyro-parathyroidectomized and parathyroidectomized rats from 75 to 100 days with comparisons for the age of from 100 to 150 days noted in an earlier paper (E. S. R., 50, p. 774). It was found that the normal males grew in respect to the several organs faster than the females, and the difference was greater than at 100 to 150 days of age.

The removal of the thyroids results especially in reducing the growth capacity of those organs primarily concerned with the vegetative functions of the body. The retardation from the operation at 75 days is, however, less than at 100 days, due to the greater strength of the growth capacity of the younger animal. The decrease in growth rate as a result of thyro-parathyroidectomy is likewise less in the male than in the female at both ages, but the sex difference tends to be less at the younger age. Toxemia following parathyroidectomy at 75 days served to cause a greater retardation of growth in males than in females and greater than resulted from the operation at 100 days. This was also true in females with respect to certain organs but not to all organs. Those having the glands removed showed more variability than normals as regards size of the vital organs. Similar results have also been found at other ages.

Studies of the thyroid apparatus.—XXII, The growth of the reproductive systems of male and female albino rats following thyro-parathyroidectomy and parathyroidectomy at seventy-five days of age, F. S. Hammett (*Amer. Jour. Anat., 34 (1924), No. 1, pp. 195–213*).—The effect of thyro-parathyroidectomy and parathyroidectomy at 75 days of age on the growth of the reproductive organs is reported and compared with the effects of the operation at 100 days of age on the same organs, as previously noted (E. S. R., 50, p. 774).

The results indicated that the retardation of growth of the reproductive organs was less at this age than at 100 days, except in case of the male gonads following parathyroidectomy. Males were less sensitive than the females to the thyroid deficiency. The reproductive systems of both sexes were less dependent for growth on the thyroid gland than the body as a whole. It is indicated that uterine growth normally lags behind that of the ovary, and more relation probably exists between the thyroid apparatus and the ovary than between the thyroid and the testicle.

Age and sex differences in the daily food-intake of the albino rat, G. H. WANG (*Amer. Jour. Physiol., 71 (1925), No. 3, pp. 729–735, figs. 2*).—Records of the daily intake of food and weekly body weights of 29 female and 17 male rats from 20 to 220 days of age are charted and discussed from the Johns Hopkins University. The records showed that the daily food intake increased with the body weight from 20 to 30 days in females, followed by a slight increase to 50 days, after which the daily food intake remained rather constant. The males showed a similar curve for food intake except that after 50 days the amount per animal averaged 1 gm. more than for the females. When placed on a calorie basis per kilogram of body weight or per square meter of body surface, there was a sharp decrease from 20 to 60 days in females and from 20 to 90 days in males, with a slight decrease as age increased thereafter. The author discusses the meaning of the differences in the food intake per unit of body size.

The changes in the amount of daily food-intake of the albino rat during pregnancy and lactation, G. H. WANG (*Amer. Jour. Physiol., 71 (1925), No. 3, pp. 736–741, fig. 1*).—Based on the food intake of four female rats during the 20 days prior to conception, the author found that the amount of food consumed was increased an average of 7.71 per cent during the 22 to 23 days of gestation, 133.85 per cent during the 21 days of lactation, and 8.20 per cent for the 20-day period following lactation. The daily activity of these animals averaged about 90 per cent normal during gestation and 85 per cent during lactation. It is pointed out that the energy necessary for embryonic development is thus obtained during pregnancy by a decrease in the activity of the dam rather than by a large increase in the food consumed.

Minerals for farm animals, L. S. PALMER (*Minn. Univ. Agr. Ext. Spec. Bul. 94 (1924), pp. 8, figs. 2*).—A popular discussion of mineral deficiencies in livestock.

A comparison of direct and indirect calorimetry in investigations with cattle, M. KRISS (*Jour. Agr. Research [U. S.], 30 (1925), No. 5, pp. 393–406*).—Based on the results of calorimetry experiments conducted with steers and cows at the Pennsylvania Institute of Animal Nutrition since 1909, the author has made a critical study of the direct and indirect methods of measuring heat production.

In 35 experimental periods with steers and 36 with cows, the heat production computed by the so-called balance method averaged 0.6 and 1.0 per cent, respectively, greater than the average observed heat production, and the maximum difference was 5.1 per cent greater in the steer experiments and 9 per cent less in the experiments with cows. The possible sources of error in the use of the indirect method are discussed, and it is pointed out that the most serious errors are liable to occur in the preparation of the samples of feeds, feces, and urine for analysis. The drying of samples of urine and feces was found to result in a considerable loss of both nitrogen and carbon. Several methods of correction were compared, but none seemed entirely satisfactory.

Errors due to changes in the glycogen content of the body, utilization of the nonnitrogenous portion of the catabolized protein molecule, or the energy of hydration and solution are unavoidable, but the possible importance of the first two errors in submaintenance trials is noted. The corrections made in the direct method of heat determination are noted, and it is pointed out that the importance of errors due to changes in the body temperature of the animal or changes in the condensation water on the walls of the chamber during the experiment can not be accurately estimated.

Direct heat measurements, as shown by alcohol tests, are relatively accurate, the recovery in certain of these experiments being 98.9 per cent of the

calculated heat, 108 per cent of the water, and 99.9 per cent of the calculated CO_2 production. It is concluded that the direct heat measurement is more accurate than the indirect method, but in determinations of the net energy values of feeds, the greater accuracy of the direct method is offset by errors due to drying of the feeds and excreta. Due to a possible changing glycogen content of the dairy cow's body, errors in indirect calorimetry experiments are liable to be greater than in such experiments with steers.

Grazing investigations, J. T. SARVIS (*U. S. Dept. Agr. Bul. 1337 (1925), pp. 16, 17*).—The results of the cooperative grazing experiments with the North Dakota Experiment Station are briefly noted for 1923 (E. S. R., 53, p. 168). The season was unfavorable for the production of native vegetation and for the condition of the animals. As in earlier years, the maximum gain was made when 7 acres of continuous pasture per animal were allowed. Ten acres were too much, and 5 or 3 acres were too little. It was necessary to remove the cattle from the last-mentioned pasture at 115 days, while the others were grazed 150 days. Cattle pastured at the rate of 4.4 acres of rotated pasture per head made within 10 per cent of the maximum gains of any of the lots. Brome grass pastured at the rate of 2.2 acres per head did not produce sufficient feed.

Winter fattening of steers, B. E. CARMICHAEL (*Md. Univ. [Agr.] Ext. Bul. 37 (1924), pp. 18, figs. 5*).—General directions for the winter fattening of steers, with special reference to Maryland conditions.

Minerals for baby beeves (*Ohio Sta. Bul. 382 (1924), pp. 47, 48*).—As in the previous experiment (E. S. R., 51, p. 468), the addition of minerals to a ration of corn, oil meal, alfalfa or clover hay, and corn silage caused only slightly greater growth. Body measurements indicated that the mineral-fed calves put more of their gain in growth, while the others showed a greater tendency to fatten.

Utilization of minerals by ewes during the period of gestation (*Ohio Sta. Bul. 382 (1924), p. 57*).—A study of various mineral balances of pregnant ewes during the gestation period showed that the nitrogen, sulfur, magnesium, potassium, and phosphorus balances were all positive on a ration of oats, corn, and linseed meal, with timothy or alfalfa hay and salt. Calcium storage was increased by the addition of precipitated bone flour to the ration. The study showed that the ewes were in negative calcium balance on the alfalfa ration during the early part of pregnancy, but that they stored calcium rapidly during the last two months. The lambs were killed at birth and analyzed, and the average calcium content was 31 gm. and the phosphorus content 20 gm. The ratio of calcium to phosphorus metabolized by the pregnant ewes for the development of the fetuses was approximately 1.5 : 1.

[Lamb feeding experiments at the Ohio Station] (*Ohio Sta. Bul. 382 (1924), pp. 49, 50*).—The results of two lamb feeding experiments are briefly noted.

In the first experiment, alfalfa and soy bean hay were compared in addition to grain and corn silage for Delaine Merino ewe lambs. During a 126-day feeding period the alfalfa fed group made average gains of 13.7 lbs., while those fed soy bean hay made average gains of 11.7 lbs. The feed cost was less in the soy bean hay group, and the waste hay was also greater in this lot.

In the second experiment standing corn alone was found insufficient for the production of economical gains in lambs. A lot of 24 lambs receiving standing corn only made average daily gains per head of 0.16 lb., while a similar lot receiving supplements of approximately 0.75 lb. of clover hay per head daily made average gains of 0.34 lb. A supplement of 0.15 lb. of linseed oil

meal daily per lamb to standing corn and clover hay further increased the rate of gain to 0.405 lb. per head daily.

The goat: Its management, breeding, and use [trans. title] (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 335 (1924), pp. 50, figs. 16*).—A popular account of the care, management, and uses of goats.

[Feeding experiments with swine at the Ohio Station] (*Ohio Sta. Bul. 382 (1924), pp. 54, 55*).—In continuing the experiments with swine, the results of the following experiments are briefly noted:

Soy beans and soy bean oil meal for pigs on pasture.—In studying the value of various soy beans and mineral supplements to corn and rape pasture, it was found that 2 lbs. each of limestone and bone meal saved 30.3 lbs. of corn, 0.4 lb. of soy beans, and 0.3 lb. of salt per 100 lbs. of gain. Soy bean oil meal as a supplement to corn produced more rapid gains than tankage or ground or cooked soy beans.

Feeding grain to pigs on rape pasture.—A comparison of various methods of feeding corn with rape pasture showed that limited feeding to the close of the grazing season resulted in a gain of 20.9 lbs. per bushel of corn as compared with gains of 19.5 lbs. with limited feeding for 8 weeks, followed by full feeding thereafter, 17.6 lbs. with full hand feeding, and 17.4 lbs. per bushel of corn with self-feeding. The possibility of limiting the amount of grain fed to March pigs during the first 2 months, followed by full feeding, is pointed out.

Hogging down corn, L. A. WEAVER (*Missouri Agr. Col. Ext. Circ. 152 (1924), pp. 4*).—Popular directions for hogging down corn.

A comparison of wheat by-products for growing pigs, E. F. FERRIN and M. A. MCCARTY (*Minnesota Sta. Bul. 219 (1925), pp. 3–10*).—The results of comparisons of standard wheat middlings, flour wheat middlings, and red dog flour when included in rations of shelled corn and tankage are reported for experiments conducted in 1923 and 1924, a preliminary account of which was previously noted (E. S. R., 53, p. 469).

Four lots of 10 pigs each were selected, averaging approximately 66 lbs. in weight in 1923 and 77 lbs. in 1924. All lots received minerals and alfalfa pasture, and in addition lot 1 received shelled corn and tankage in the proportion of 90 per cent corn and 10 per cent tankage, while lots 2, 3, and 4 received shelled corn and tankage, with standard wheat middlings, flour wheat middlings, and red dog flour, respectively. The proportions of these feeds were 65 per cent corn, 30 per cent of the wheat by-products, and 5 per cent tankage until an average weight of 100 lbs. was attained, after which the proportions were 75 per cent corn, 23 per cent wheat mill feeds, and 2 per cent tankage. The method of feeding consisted of putting the shelled corn in a trough and feeding the tankage and wheat by-products as a slop.

The average daily gains made in the two years, the pigs being fed to an average weight of 200 lbs. in each case, were 1.09 lbs. per head for the check lot, 1.11 lbs. with the standard middlings supplement, 1.16 lbs. with the flour middlings supplement, and 1.12 lbs. with the red dog flour supplement. The total feed required per 100 lbs. of gain in the respective lots was 387, 397, 383, and 388 lbs. The results showed that the rations including standard middlings or flour middlings were slightly superior to those including corn and tankage only or corn, tankage, and red dog flour.

It is concluded that when wheat mill feeds can be bought for a price not greater than that of corn, their use as a substitute for about 25 per cent of the corn and 40 per cent of the tankage is recommended. Under such conditions flour wheat middlings is to be preferred.

Rice bran, corn, and copra meal as supplements to camote vines for growing pigs, T. P. ALLAS (*Philippine Agr., 13 (1924), No. 6, pp. 255–259*).—

The results of two experiments are reported in which rice bran and corn meal were compared as supplements to camote vines for fattening swine. Three lots of four pigs each were fed as the experimental animals.

The first experiment lasted 112 days, during which the different lots received rice bran, ground corn, and a mixture of equal parts of rice bran and ground corn, respectively, in addition to 6 kg. per lot daily of green camote vines. The pigs averaged 6 kg. in weight at the start and 24, 13, and 16 kg., respectively, in the different lots at the end of the experiment. Thus rice bran proved more efficient than corn meal, and the mixture was only slightly better than corn alone. Corn tended to stunt the pigs, while rice bran tended to make them somewhat pot-bellied, due to its bulk.

In the second experiment, which lasted 63 days, the same pigs were used, but were redistributed in the three lots. In addition to the 7 kg. of camote vines fed to each lot daily, the pigs of lot 1 received rice bran, lot 2 a mixture of ground corn and copra meal (2:1), and lot 3 rice bran and copra meal (2:1). The pigs averaged 19 kg. in weight at the start of the test, but at the end lot 1 averaged 39 kg.; lot 2, 28; and lot 3, 40 kg. The two lots receiving rice bran did equally well, while corn proved inferior. By feeding the camote vines instead of pasturing, much more feed was obtained from a unit area.

Contribution to Swiss swine breeding, with special reference to the spaying of females, A. WALTER (*Ein Beitrag zur Schweizerischen Schweinezucht, Speziell zur Frage der Kastration Weiblicher Schweine. Inaug. Diss., Univ. Zurich, 1924, pp. 53*).—Hog production in Switzerland is briefly discussed, followed by an account of the spaying operation with reference to its advisability for practical pork production.

Connecticut's poultry industry, I. G. DAVIS (*Conn. Agr. Col. Ext. Bul. 79 (1924), pp. 42, figs. 12*).—An economic discussion of the poultry industry in Connecticut.

[Experiments with poultry at the Ohio Station] (*Ohio Sta. Bul. 382 (1924), pp. 51–54, fig. 1*).—The results of feeding experiments with poultry are briefly reported, some being continuations of previous experiments (E. S. R., 51, p. 471).

Rearing chicks to maturity indoors.—Further investigations of this project showed that pullets reared on a ration of 80 parts of a mixture of white corn and wheat middlings (2:1), 16 parts of casein, and 4 parts of a salt mixture plus 2.5 per cent of cod liver oil started to lay at 4.5 months of age. They produced an average of 44.3 eggs per bird on this ration during 4 months without access to direct sunlight. In further experiments it was found that 15 per cent of egg yolk could be substituted for the cod liver oil. A more practical mash of yellow corn, standard wheat middlings, wheat bran, sifted ground oats, and meat scraps (20:20:20:20:10) supplemented with 2 per cent of cod liver oil was found to give equally as good results.

Relation of sunlight and green feed to leg weakness in chicks.—Ten groups of 25 White Leghorn chicks each were used in this experiment. All received the basal ration of white corn and standard wheat middlings 80 per cent, casein 16, and salt mixture 4 per cent. Various amounts of fresh second-growth red clover were furnished as supplements to the different groups and without the exposure to direct sunlight for from 0.5 to 1 hour daily.

The general results showed that confined chicks receiving green clover up to 18 per cent of the ration developed leg weakness between the sixth and eighth weeks. The development of leg weakness was, however, inhibited by short exposures to direct sunlight, and the rate of growth was approximately doubled. Green feed and soil appeared to exert a slight influence by delaying the onset of leg weakness.

Protein and minerals in the mash for laying hens.—As in the earlier experiments, the first limiting factor in egg production resulting from a reduction in the amount of meat scrap in the mash appeared to be a lack of minerals. When 2 per cent of minerals were furnished in addition to a mash containing 10 per cent of meat scrap, egg production was practically equal to that on a mash containing 20 per cent of meat scrap. Twenty per cent of cottonseed meal, with minerals, was not nearly equal in its ability to stimulate egg production to a mash containing 20 per cent of meat scrap.

The effect of copra meal as a mash supplement for laying hens, A. T. Taleon (*Philippine Agr., 13 (1924), No. 3, pp. 109–113, fig. 1*).—The results are reported of a one year's experiment in comparing the value of adding copra meal to the mash of laying hens receiving a scratch feed of corn and rice and a mash of corn meal and rice bran. Two lots of 10 hens each were used in the experiments.

Birds receiving the copra meal as one-third of the mash made average gains in live weight of 305 gm. during the year as compared with 160 gm. by the lot receiving no copra meal, but the average egg production for the year by the former lot was only 61 as compared with 82 by the latter. The difference in production is attributed to the presence of toxins in the copra meal. The feed consumption and the size of the eggs produced by the two lots were similar.

Feeding for eggs, D. C. Kennard and P. S. White (*Ohio Sta. Mo. Bul., 10 (1925), No. 3–4, pp. 55–64*).—A popular discussion of the essentials to be considered in feeding for egg production.

The relation of calcium restriction to the hatchability of eggs, G. D. Buckner, J. H. Martin, and A. M. Peter (*Amer. Jour. Physiol., 71 (1925), No. 3, pp. 543–547*).—In making a study of the relation of the shell to the hatchability of hens' eggs at the Kentucky Experiment Station, 3 lots of 10 hens each were fed from November 1, 1923, to May 1, 1924, on the same ration of corn, wheat, buttermilk, and calcium-free grit, with green feed twice weekly. In addition, lots 1 and 2 received oyster shells and lot 1 was given free range, while lots 2 and 3 were confined. Eggs were incubated from each lot on March 14 and 28 and April 11. The hatching percentages for lots 1, 2, and 3 for the first setting were 65.8, 40.6, and 21.0 per cent, respectively, for the second setting 63.8, 35.7, and 17.7 per cent, and for the third setting 43.6, 57.6, and 0 per cent, respectively.

The largest percentage of dead embryos in lot 3 occurred in the first and second hatches from the eighteenth to the twenty-first day of incubation, but in the third hatch there was a greater mortality prior to the eighteenth day. Tests of the eggs showed that the average shell weights previous to the first setting were 5.2, 5.4, and 3.5 gm. for the eggs from the respective lots. After May 1 oyster shells were given to lot 3 but taken away from the rations of lots 1 and 2, and three more settings were made on May 12 and 27 and June 10, with hatching percentages for the three lots as follows: First hatch 21.7, 10.8, and 20.7 per cent, for the second hatch 18.2, 15.2, and 32.5 per cent, and for the third hatch 41.9, 4.6, and 36.1 per cent, respectively. The results thus showed a distinct relation between the calcium supply of the hens and the hatchability of the eggs. It is suggested that the poor results from thin-shelled eggs may be due to an unnatural carbon dioxide-oxygen exchange, increased evaporation, or modified calcium metabolism of the embryo.

The early embryology of the chick, B. M. Patten (*Philadelphia: P. Blakiston's Son & Co., 1925, 2. ed., pp. XI+177, pl. 1, figs. [63]*).—This deals with the development of the various tissues of the chick through the first four days of incubation.

Turkey pointers, J. H. MARTIN (*Ky. Agr. Col. Ext. Circ. 178 (1925), pp. 12, figs. 8*).—This gives general directions for the care, management, breeding, and feeding of turkeys, with suggestions for the prevention of disease.

The probable occurrence of xerophthalmia in turkeys, G. C. MCCLENDON (*Soc. Expt. Biol. and Med. Proc., 22 (1924), p. 184*).—This is a brief account of the occurrence of ophthalmia in turkeys, which was apparently cured by feeding full cream cheese.

DAIRY FARMING—DAIRYING

The comparative value of peanut meal, cottonseed meal, and soybean meal as sources of protein for milk production, C. W. HOLDAWAY, W. B. ELLETT, and W. G. HARRIS (*Virginia Sta. Tech. Bul. 28 (1925), pp. 5–54, figs. 9*).—An analysis is reported of the data collected in feeding and digestion trials with dairy cattle in which peanut meal, cottonseed meal, and soy bean meal were fed. The comparative utilization of the proteins of these feeds for milk production was determined, first, by calculating the relation of total crude protein in the feed and the digestible crude protein to the milk protein produced, and, second, by comparing the true resorbed protein with the sum of the milk protein, maintenance protein, metabolic feces protein, and body gains or losses.

Two cows were used for the investigations with peanut meal. Two digestive trials were conducted during a 68-day maintenance period and during 4 milk-production trials in which 1 cow was started on a high protein and the other on a low protein level. The plane of protein intake was reversed in each case as the experiment progressed. The feeds employed consisted of corn silage, corn meal, peanut meal, and starch, the peanut meal making up 24 per cent of the maintenance ration and 62 per cent of the ration for milk production.

From the results it was calculated that there was required for the production of 1 lb. of nitrogen in the milk a total of 3.38 lbs. of crude protein or 2.01 lbs. of digestible crude protein from the peanut meal. These requirements included that necessary for maintenance. By the second method of comparison 2.01 lbs. of resorbed protein were required per pound of milk protein produced after making necessary corrections for changes in body weight.

The cottonseed meal made up 15 per cent of the ration in the maintenance trials with this feed. Two cows were used for determining maintenance, while in the milk-production periods 4 cows were employed, 2 of which were started on a high level of protein intake and ended on a low level, while the other 2 were fed in the reverse order. The results showed that 3.59 lbs. of crude protein nitrogen from the cottonseed meal or 2.16 lbs. of digestible crude protein nitrogen were required to produce 1 lb. of milk nitrogen. The resorbed cottonseed meal protein required per pound of milk protein corrected for gains or losses in body weight was 3.07 lbs.

Four cows were used in the trials with soy bean meal, which were conducted similarly to those with cottonseed meal except that the maintenance data were calculated from the preceding trials. As with the cottonseed meal, 3.59 lbs. of soy bean crude protein were required per pound of milk protein. The digestible crude protein requirement was slightly higher with the soy bean meal, 2.23 lbs. There were required 2.76 lbs. of resorbed protein per pound of milk protein produced after making necessary corrections for changes in body weight. The table below gives additional comparative data bearing on the metabolism of the proteins of peanut meal, cottonseed meal, and soy bean meal, showing that the efficiency ranks in the order of peanut meal, cottonseed meal, and soy bean meal when the digestible crude protein required for milk produc-

tion is used as a basis, but due to the higher digestibility of soy bean meal protein the total crude protein requirement in cottonseed meal and soy bean meal were equal. On the basis of the resorbed protein required, peanut meal was again first, with soy bean meal second and cottonseed meal last.

Utilization of peanut meal, cottonseed meal, and soy bean meal proteins for milk production

Kind of protein	Protein excreted per pound of total digestible crude protein intake				Utilization of proteins				
	Urine	Feces	Milk	Lost	P	Y	Ratio milk N to resorbed N[1]	Resorbed protein per pound of milk and maintenance protein[1]	Resorbed protein per pound of milk protein[1]
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Per cent*	*Per cent*	*Per cent*	*Pounds*	*Pounds*
Peanut meal	0.541	0.811	0.537	0.078	84	47	38	1.56	2.61
Cottonseed meal	.603	.876	.522	.125	78	48	33	1.67	3.07
Soy bean meal	.570	.584	.441	.011	77	47	36	1.62	2.76

[1] ±nitrogen balance.

$$P=\frac{\text{Maintenance } N+\text{metabolic } N+\text{milk } N+\text{nitrogen balance}}{\text{Resorbed nitrogen}}\times 100$$

$$Y=\frac{\text{Milk nitrogen}}{\text{Maintenance } N+\text{metabolic } N+\text{milk } N}\times 100$$

The feeding value and utilization of rape seed and hemp seed cake [trans. title], N. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 274* (*1924*), *pp. 18*).—A ration of 1.5 kg. of rape seed cake per head daily was compared with one of 0.75 kg. of peanut cake and 0.75 kg. of ground oats for milk production during three experimental periods. The average results showed that the rape seed groups excelled in live weight by 1 kg., daily milk production by 0.19 kg., fat content of the milk by 0.07 per cent, and daily butter production by 17 gm. as compared with the lot receiving the peanut cake and ground oats.

In other experiments it was found that 2.25 kg. of rape seed or hemp seed cake could be fed daily without unfavorable consequences. The feeding value of the hemp seed cake was slightly less than that of rape seed cake. The amounts required to furnish 1 fodder unit were calculated from 0.9 to 1, averaging 0.95 kg. of rape seed cake and from 1 to 1.2, averaging 1.05 kg. of hemp seed cake.

[**Experiments with dairy cattle at the Ohio Station**] (*Ohio Sta. Bul. 382* (*1924*), *pp. 45, 46*).—The results of the following experiments are briefly reported:

Soy beans in silage v. soy beans as hay.—Six milch cows were used in comparing the feeding value of soy beans as hay and ensiled with corn at the rate of 1 part of soy beans to 2 of corn. An advantage of 3 per cent was indicated for the corn-soy bean silage in feeding value.

Legumes for growth of dairy heifers.—In continuing this study (E. S. R., 51, p. 475), heifers receiving soy beans or alfalfa hay with corn meal made practically equal growth until calving. This growth was better than normal and better than the growth of similar heifers on a ration of corn, bran, oil

meal, mixed hay, and pasture. The calves produced by the heifers were also above normal in weight.

Minerals in the dairy ration, C. F. MONROE (*Ohio Sta. Mo. Bul., 10 (1925), No. 3-4, pp. 35-41*).—A review of experiments relating to the mineral requirements of dairy cattle, with special reference to calcium and phosphorus and their sources.

Thirteenth annual report of the International Association of Dairy and Milk Inspectors (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 13 (1924), pp. 291, figs. 5*).—The usual report of the annual meeting of this association (E. S. R., 50, p. 875), held at Detroit, October 17, 18, and 20, 1924, includes numerous papers and other material as follows:

Presidential Address (pp. 33-36), by J. B. Hollingsworth; Report of Committee on Dairy Methods: Copper in Milk and Its Relation to the Vitamine Potency (pp. 37-51), by G. C. Supplee; Report of Committee on Bovine Diseases: Their Relation to the Milk Supply and to the Public Health (pp. 52-59), by W. A. Shoults; Report of Committee on Pasteurization of Milk and Cream (pp. 60-88), by W. H. Price; The Extent of Milk Pasteurization in Cities of the United States (pp. 89-97), by I. V. Hiscock and R. Jordan; Report of Committee on Milk Plants (pp. 98-101), by C. E. Clement; Survey of Bottle-washing Methods and Equipment (pp. 102-106), by W. D. Dotterer; The Use of Milk in Urban Communities (pp. 107-115), by I. V. Hiscock and J. L. Rice; How Boston Handled the Milk Problem (pp. 116-119), by J. O. Jordan; Remarks by E. R. Gauhn (p. 120); What the Dairy Division Has Done for Boston (pp. 121-126), by A. R. Tolland; Ventilation of the Dairy Stable as a Vital Factor in the Production of Milk (pp. 127-131), by H. O. Daniels; Report of Committee on Serving Milk in Schools (pp. 132-145), by W. P. B. Lockwood; Practical Observations while Serving Milk Lunches to School Children (pp. 146-150), by Mrs. B. R. East; Proper Production the First Essential (pp. 151-155), by R. F. Leslie; The Effect of the Tuberculin Test of Cattle on the Milk Supply of a City of about 100,000 Population (pp. 156-158), by H. E. Bowman; Actinomycosis and the Public Health (pp. 159-165), by G. H. Grapp; Foot-and-mouth Disease and Its Relation to the Public Milk Supply (pp. 166-169), by C. C. Wing; Dairy Methods (pp. 170-173), by P. Schletty; Two Years' Experience with the Methylene Blue Reductase Test in Improving Milk Supplies (pp. 174-178), by C. S. MacBride; The Methylene Blue Test as an Adjunct to Milk Inspection (pp. 179-185), by C. H. Chilson and E. J. Smith; The Use of Eosin-methylene Blue Culture Media in Milk Examination (pp. 186-188), by E. L. Moore; Contrast in the Keeping Quality of Raw Milk Supplies with and without the Application of the Reductase Test (pp. 189-193), by H. A. Harding and A. R. Ward; Methods Used for Cooling and Storing Milk on Farms by Dairymen Selling Milk in the City of Richmond (pp. 194-196), by T. J. Strauch; Some Experiments with Holding Tanks (pp. 197-211), by S. M. Heulings, G. W. Grim, and D. W. Horn; The Practicability of the Cooledge pH Test in the Improvement of a City Milk Supply (pp. 212-216), by H. R. Estes; Report of Committee on Food Value of Milk and Milk Products (pp. 217-235), by I. V. Hiscock; A Summary of the Work of the National Dairy Council (pp. 236-242), by M. O. Maughan; A Study of Continuous-flow Machines, Part I (pp. 243-245), by C. H. Chilson; A Study of Continuous-flow Machines, Part II (pp. 246-248), by C. O. Wisler; Tests of Certified and Pasteurized Milk for *B. Coli*-like Colonies on Endo Medium (pp. 249-251), by F. O. Adams and A. R. Ward; The Function of the State in Milk Sanitation (pp. 252-267), by L. C. Frank; The Standardization of the Methylene Blue Reduction Test for Milk Control Work (pp. 268-275), by E. G.

Hastings; Report of Committee on Methods of Bacterial Analysis of Milk and Milk Products (pp. 276–279), by G. E. Bolling; The Relation of Prepasteurized Milk to Certain Forms of Gastro-enteritis in Infants (pp. 280–285), by J. H. Shrader; An Observation (p. 286), by J. H. Shrader; and Some Observations on the Scientific Control of Milk Plants from the Standpoint of Bacteria (pp. 287–291), by G. B. Taylor.

Milk and its products, A. MONVOISIN (*Le Lait et les Produits Dérivés. Paris: Vigot Bros., 1925, 3. ed., vol. 1, pp. XVI+470, figs. 53*).—This is the first volume of the third edition of the book previously noted (E. S. R., 44, p. 178), dealing with the physiology of milk production, the bacteriology, chemistry, and physics of milk, and the manufacture of the different dairy products.

The length of life of lactic acid bacteria in chalk milk and soil cultures [trans. title], C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 267 (1924), pp. 12*).—Lactic acid bacteria of the *Streptococcus lactis* group have been kept alive for nine years, without transfer, in skim milk to which chalk was added and for five years in sterile soil which had completely dried out. The bacteria did not undergo any morphological changes nor was the ability to ferment lactose affected.

Neutralization of cream for buttermaking, W. F. JONES (*Canada Dept. Agr. Pamphlet 52, n. ser. (1925), pp. 8*).—Popular directions are given for neutralizing cream for butter making, with tables for easy calculation of the amounts of different neutralizers to use in reducing cream of varying acidity to 0.25 per cent acid.

Mammary microflora in relation to cheese making, C. GORINI (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 1, pp. 65–87, pls. 3*).—The true mammary microflora consists essentially of micrococci and streptococci characterized by proteolytic and lipolytic activities. These forms are so variable and appear to be so much related that the author suggests that all be called mammary cocci. All other types except the abortion bacillus obtained from sterile milkings are thought to result from outside entrance through the teats. Much difference in the kind and amount of bacteria in different quarters of the same udder, as well as in different udders, has been observed. The mammary flora has no injurious effects under normal conditions, but may cause mastitis in certain cases and may injure the quality of the milk, especially for cheese making.

The relation of the Streptococcus lactis content of curdling milk to the rapidity of the ripening of cheese, II [trans. title], E. HAGLUND, C. BARTHEL, and E. SANDBERG (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 270 (1924), pp. 18*).—As in the earlier investigations (E. S. R., 51, p. 179), it could not be determined whether the increased rate of ripening in hard cheese associated with a high bacterial content was due to the increase in the number of bacteria or to the accompanying increase in lactic acid. Ripening was hastened when the curdling milk had a low bacterial content and a high acidity and also when there was a low acidity and a high bacterial content in the curdling milk.

VETERINARY MEDICINE

Immunity in natural infectious disease, F. D'HERELLE, trans. by G. H. SMITH (*Baltimore: Williams & Wilkins Co., 1924, pp. 399*).—This is the authorized English translation of the volume which is essentially a revision of the French text Les Défenses de l'Organisme, in which an attempt has been

made to correlate the phenomenon of bacteriophagy with those of immunology and serology. The subject matter is dealt with in four sections: The reactions of living matter, the reactions against inanimate agents, the reaction against bacteria, and the ultraviruses and immunity against them.

"Hormone" mediums.—Simple method of preparation and value of hormone blood agar for preserving pneumococci and streptococci, S. F. Bailey (*Jour. Infect. Diseases, 36 (1925), No. 3, pp. 340–342*).—A modification is described of the Huntoon method of preparing hormone agar and gelatin broth media (E. S. R., 39, p. 583). The modified method produces a medium which is rich in growth-producing factors because the agar has already been melted and cooled when brought into contact with the raw uncoagulated meat particles, which retain these factors since they are not removed by the manner of filtration or by overheating. This is economical, because the meat is removed by filtration, so that the relatively large amount of medium usually cut off and thrown away is saved, and it is clear and free from discoloration because the reaction is not adjusted until after the meat has been removed.

Poisonous plants of France, A.-L. Marchadier and A. Goujon (*Notions Pratiques de Toxicologie Végétale Indigène. Paris: Libr. Octave Doin, 1924, pp. 284, figs. 66*).—The poisonous plants indigenous to France are dealt with, the arrangement being according to the nature of their toxic properties.

Pathogenic power of M. melitensis and B. abortus for rats and mice [trans. title], E. Burnet and J. L. de Lagoanere (*Arch. Inst. Pasteur Tunis, 13 (1924), No. 2, pp. 182–191*).—To determine whether rats or mice are a source of danger in the transmission of *Bacillus abortus* or *Micrococcus melitensis*, attempts were made to infect white rats and mice with each organism by ingestion and subcutaneous injection.

The white rat proved very resistant to both organisms. When injected subcutaneously a dosage 1 to 1,000,000 times more concentrated than that required for guinea pigs was necessary, and very large doses were required when administered by ingestion. The infection disappeared very rapidly. A further proof of the resistance of rats to infection by *M. melitensis* was afforded by the negative results obtained on the examination for this organism of the carcasses of 65 wild rats captured in goat stables in Tunis in which 5 per cent of the goats had been proved carriers of *M. melitensis*.

Mice proved about as sensitive as guinea pigs to infection with both organisms, particularly following subcutaneous injections. No differences were noted in susceptibility toward either organism such as would serve to distinguish between the two.

The influence of hydrogen ion concentration on the biology of the anthrax organism, S. H. Whitworth (*Thesis, Inst. Vet. Path. Univ. Zurich, 1924, pp. 130, figs. 13*).—Part 1 of this account (pp. 5–24) deals with the theory of H-ion concentration, buffers, and the influence of H-ion concentration and other factors on the growth of microorganisms, and includes a table of limits of H-ion concentration which permit growth of organisms. Methods and technique employed generally in the various experiments are dealt with in part 2, which reports upon experimental work in detail (pp. 25–122). The paper includes a list of 56 references to the literature.

Report of the departmental committee appointed by the Minister of Agriculture and Fisheries to consider the outbreak of foot and mouth disease which occurred in 1923–1924, E. G. Pretyman et al. (*London: Min. Agr. and Fisheries, 1925, pp. 86; abs. in Jour. Compar. Path. and Ther., 38 (1925), No. 1, pp. 76–82*).—This is a report of the committee appointed by the Minister of Agriculture and Fisheries on February 8, 1924, to examine into the circumstances of the recent outbreak of foot-and-mouth disease in Great

Britain, to review and report upon the slaughter policy and the procedure adopted by the Ministry of Agriculture, to advise whether any further precautions should be taken to guard against the introduction and spread of the disease, and to consider whether a scheme of insurance can be devised as an alternative to the existing system of compensation for slaughtered animals. The report opens with some general remarks as to the characters of outbreaks of foot-and-mouth disease and the reasons for the adoption of the slaughter policy and the imposition of restrictions on movement. It is concluded that until the pathology of foot-and-mouth disease is better understood no other policy seems practicable, nor is there any conceivable means of avoiding those primary outbreaks which are apparently air-borne. It is recommended that the present system of State compensation should be continued, and that no scheme of compulsory insurance should be instituted.

On foot-and-mouth disease, S. STOCKMAN (*Vet. Rec., 5 (1925), No. 19, pp. 377-384*).—This is a discussion of foot-and-mouth disease, including a table showing its occurrence in Great Britain since 1877 and a statement as to its prevalence in various countries, month by month, during 1923 and 1924.

Studies on the single-injection method of vaccination as a prophylactic against rabies in dogs, H. W. SCHOENING (*Jour. Agr. Research* [*U. S.*], *30 (1925), No. 5, pp. 431-439*).—In experimental work here reported, the vaccines used consisted of several lots prepared in the laboratory of the U. S. D. A. Bureau of Animal Industry and others obtained from commercial houses manufacturing this product. The author found that the virus to which vaccinated dogs were exposed was the factor which determined the efficacy of the single-injection method of vaccination. Against one virus no protection was afforded vaccinated animals, while against two other viruses distinct protection was afforded, indicating that there is more than one strain of rabies street virus in this country. It is pointed out that the vaccines prepared in this country by commercial houses are all made from a strain of fixed virus having its origin in the Pasteur Institute of Paris.

The protection of dogs against rabies by Umeno's method of preventive inoculation, S. HATA (*Jour. Immunol., 9 (1924), No. 3, pp. 89-93*).—"The results are presented of 104,629 preventive inoculations of dogs against rabies in Tokyo and Yokohama and their environs during the period since the adoption of Umeno's prophylactic method [E. S. R., 51, p. 480]. It is shown that only 41 of the inoculated dogs developed rabies, while 1,699 of the uninoculated group contracted the disease, notwithstanding the latter group represented only one-third of the total number of dogs in the two prefectures."

Treatment of camels affected with Trypanosoma soudanense with Bayer 205, and further observations on the formol-gel test, R. H. KNOWLES (*Jour. Compar. Path. and Ther., 38 (1925), No. 1, pp. 42-46*).—The author's work indicates that Bayer 205 is a valuable remedy for the treatment of trypanosomiasis of camels. Camels tolerate well the intravenous injection of 10 per cent aqueous solution of Bayer 205, and one dose of 10 gm. appears to be sufficient for the cure of trypanosomiasis.

Bayer 205 (Naganol), H. HARTNACK (*Vet. Med., 20 (1925), No. 4, pp. 143, 144*).—A brief summary of information on this therapeutic agent.

Immunological studies in tuberculosis.—II, Further observations on skin hypersensitiveness in experimental tuberculosis, S. A. PETROFF (*Jour. Immunol., 9 (1924), No. 4, pp. 309-317*).—Two of the guinea pigs used in the first part of this investigation (E. S. R., 50, p. 80) were tested for skin hypersensitiveness to tuberculin at intervals until death. A definite, though rather feeble, reaction was given by one 453 and by the other 497 days after the original test. On autopsy no evidence of tuberculosis was obtained. In a

second series of experiments conducted on 5 guinea pigs it was demonstrated that as small an amount as 3.75 mg. of killed tubercle bacilli can induce a state of hypersensitiveness persisting for 382 days.

It is pointed out that for success in such sensitization the bacilli should be triturated well and the reaction adjusted to pH 6.9 or 7 before sterilization. The animals should weigh at least 400 gm. and be kept in good condition. The injections should be made every 3 or 4 days by the intraperitoneal route.

Contagious diseases of animals, with special reference to their prevention, J. M'Fadyean (*Jour. Compar. Path. and Ther., 38 (1925), No. 1, pp. 56–68*).—Under the heading of diseases that have been eradicated from the United Kingdom, the author considers sheep pox, cattle plague or rinderpest, pleuropneumonia, epizootic lymphangitis, and rabies. Diseases that have not yet been eradicated there include glanders, hog cholera, anthrax, tuberculosis, and foot-and-mouth disease.

Some laboratory methods for parasitological investigations, M. C. Hall and E. B. Cram (*Jour. Agr. Research [U. S.], 30 (1925), No. 8, pp. 773–776, fig. 1*).—The use of graduated screens in examining feces for parasitic eggs and worms is recommended, the screening method being described.

A test of the tobacco powder and lime mixture for the destruction of warble maggots, H. W. Thompson (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 200, 201*).—The author reports that on two farms the warble mortality on tied-up animals after two dressings consisting of 1.5 lbs. of fresh lime, 4 lbs. of tobacco powder, and 1 gal. of water was about 90 per cent, and that a third application about three weeks after the first was sufficient to kill all the warbles. Ninety-five animals in six herds running at large were dressed twice, resulting in the destruction of 470 of 631 warbles, or 74.5 per cent.

Stomach worms and nodular diseases of sheep (*Ohio Sta. Bul. 382 (1924), pp. 50, 51*).—Experiments were conducted in 1923, in continuation of those of the preceding year (E. S. R., 51, p. 481), in which stomach-worm infestation was reduced 94.5 per cent by management alone. In addition to such management, half the lambs in both forage and permanent pasture lots received the copper-sulfate treatment for stomach worms. The lambs on rape forage were changed to fresh forage at 2-week instead of 10-day intervals as in the first test in 1922. Post-slaughter examinations were made of the stomachs and intestines of all the lambs in the different groups.

The results indicate that stomach-worm infestation in lambs on permanent pasture was held in check by administering the copper-sulfate treatment, that the better management, as employed in this test, was sufficient to reduce stomach worm and nodular infestation, and that the copper-sulfate treatment in addition to this management eliminated stomach-worm infestation completely. In the permanent pasture lot the medicinal treatment was of no value in preventing nodular disease.

Management for the control of gastro-intestinal parasites of sheep, 1922 [and 1923] (*Ohio Sta. [Leaflet], 1924, pp. [2]*).—The details of tests conducted in 1922, previously reported in Bulletin 373 (E. S. R., 51, p. 481), and of tests in 1923, noted above from Bulletin 382, are here presented, partly in tabular form.

The treatment of a flock of sheep for one year with carbon tetrachlorid, M. C. Hall and J. E. Shillinger (*North Amer. Vet., 6 (1925), No. 5, pp. 31–36*).—The investigations here reported have led the authors to conclude that "carbon tetrachloride, given in amounts of 5 cc. in capsules to sheep weighing 41 to 118 lbs. (19 to 54 kg.) and accompanied by one No. 11 capsule (10 cc. capacity) full of dry magnesium sulfate, is highly effective in removing stom-

ach worms, removing all of them in a large majority of cases (5 out of 6) and leaving a few in a small minority of cases (1 out of 6). In repeated doses at intervals of three weeks it would evidently keep a flock practically free from infestation and practically prevent renewed pasture infestation after the first dose. Used in this way it should serve to clean infested pastures, as the new infestations picked up on pasture would be completely cleaned out in the majority of cases by the next dose. How long it would take to clean a pasture is not known, but it is theoretically probable that dosing for two years would restore a pasture from a condition of heavy infestation to a practically clean pasture.

"Carbon tetrachloride in repeated doses will diminish infestations with thin-necked strongyles (*Nematodirus* spp.) to the point where sheep showing originally a very heavy infestation will show very few and in some cases none at the end of a year. It will diminish infestations with small trichostrongyles to the point where previously heavily infested sheep will show such small numbers as 3, 20, and 75 worms, a very small count, at the end of a year. It will apparently eradicate nodular worms and whipworms from an infested flock in the course of a year. It will not eradicate *Strongyloides papillosus* in the course of a year, but, judging from fecal examinations and post-mortem examinations, it may have some value as a control measure in keeping down heavy infestations. It does not appear to be of value in the control of tapeworms. . . . The gains in weight made by a cull lot of sheep under this treatment indicate that it is not only well tolerated but decidedly beneficial."

The effect of a year's treatment with carbon tetrachlorid on a flock of sheep, C. CURTICE (*North Amer. Vet., 6 (1925), No. 5, pp. 37, 38*).—The work here reported, conducted in connection with the investigations of Hall and Shillinger above noted, has led the author to conclude that, from the effects shown in a flock of cull lambs, by increase in weight and by the disappearance or great diminution in numbers of parasitic nematodes, carbon tetrachloride is very effective in controlling them.

A quantitative study of the absorption and excretion of the anthelmintic dose of carbon tetrachloride, H. S. WELLS (*Jour. Pharamcol. and Expt. Ther., 25 (1925), No. 3, pp. 235–273, figs. 5*).—This is a report of investigations conducted in the pharmacological laboratory of the Johns Hopkins Medical School, in continuation of those previously reported (E. S. R., 49, p. 382; 50, p. 282; 53, p. 278). The details of a quantitative study of the absorption of the therapeutic anthelmintic dose of the drug from the intestinal tract of the dog and of the excretion in the expired air of dogs and of man are presented.

A pathological study shows that the livers of dogs receiving 3 cc. of the drug by mouth are very badly damaged, but that when a like amount is injected into isolated intestinal loops the damage is somewhat more severe but not excessively so. Animal experiments are said to indicate that, following the absorption of carbon tetrachloride from the intestine, it is rapidly excreted in the expired air, and that a high percentage of the drug passes off in this manner.

Tetrachlorethylene, a new anthelmintic, M. C. HALL and J. E. SHILLINGER (*Amer. Jour. Trop. Med., 5 (1925), No. 3, pp. 229–237*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry. Experiments to date have led the authors to conclude that tetrachlorethylene is as effective as carbon tetrachloride and may be slightly more so. The indicated dose for dogs would be at the rate of 0.2 to 0.3 cc. per kilogram, and that for man would not be over 3 cc. and might be as little as 2 cc. for the removal of hookworms. It would be about as effective as carbon tetrachloride in removing ascarids from dogs, and would probably show the same inferiority to chenopodium for the

removal of ascarids from man. The safety of the drug is thought to be very close to that of carbon tetrachloride, and would probably produce the same lesions, usually a hepatic necrosis healing in the course of one to two weeks, and would have the same contraindications. The cost of the drug is two to three times that of carbon tetrachloride.

Male fern: Its toxicology and its use in liver rot, R. F. MONTGOMERIE (*Jour. Compar. Path. and Ther., 38 (1925), No. 1, pp. 1–26*).—The results obtained in three series of experiments here reported show that the administration of an amount of male fern much less than that which may be expected to prove fatal to Welsh Mountain ewes destroys all the flukes present in the larger bile ducts of such animals. The quantity which it is necessary to administer to lambs for this purpose is also much less than that which proved fatal to an infested lamb. Observations on the treatment of 70 sheep, half of which were treated with Danistol and half with liquid extract of male fern, B. P., do not confirm the claim that the former preparation is more efficient than the latter.

A contribution on the blood of normal horses, particularly thoroughbreds [trans. title], J. E. HAUBER (*Arch. Wiss. u. Prakt. Tierheilk., 51 (1924), No. 1, pp. 77–89*).—This is a report of investigations covering the findings in 64 equines, including 52 thoroughbreds (9 yearlings) and 12 pacers. The paper includes a list of 35 references to the literature.

Further investigations of infectious equine anemia in Nevada, L. H. WRIGHT (*Jour. Agr. Research [U. S.], 30 (1925), No. 7, pp. 683–691, figs. 12*).—This is a report of further investigations at the Nevada Station (E. S. R., 21, p. 584; 43, p. 83) of a disease among horses in Nevada which is apparently identical with that known in other States and countries as infectious equine anemia, swamp fever, infectious anemia, etc. This disease is characterized clinically by irregularly remittant fever, rapid emaciation, marked loss of energy, depletion of red blood cells in most cases, edema, usually bloody nasal discharge, and eventually death. The mortality is nearly 100 per cent, real recovery rarely, if ever, taking place.

"The disease is transmissible to other horses by the injection of infected blood or splenic emulsion, the period of incubation being from about two weeks to several months. The etiological factor is apparently ultramicroscopic, since the disease can be reproduced by the injection of Berkefeld filtrates and is not recognizable by ordinary staining methods in smears from the blood, tissues or exudates, and transudates. The natural mode of transmission is not known, but is most likely through the bites of insects. Methods of treatment thus far used have proved unsuccessful, killing the infected animals being necessary to prevent spread of the disease. A positive diagnosis can only be secured by animal inoculation. Animals other than equines are not susceptible to the disease."

Ascaridia lineata, a parasite of chickens in the United States, B. SCHWARTZ (*Jour. Agr. Research [U. S.], 30 (1925), No. 8, pp. 763–772, figs. 18*).—The author finds that *A. lineata*, originally described from Brazil by Schneider, is the common intestinal roundworm of chickens in the United States, the occurrence of *A. perspicillum* in this country having not yet been established on the basis of morphological comparisons. *A. lineata* is recorded for the first time as a parasite of the goose, on the basis of specimens from Indo-China. In view of the apparent absence of *A. perspicillum* from American chickens, various facts published in the United States concerning the life history, pathology, and physiology of *A. perspicillum*, as well as facts pertaining to medicinal treatment, in all probability refer to *A. lineata*.

The coccidia and coccidioses of the rabbit, C. PÉRARD (*Jour. Compar. Path. and Ther., 38 (1925), No. 1, pp. 69–72*).—This is an abstract of an account previously noted (E. S. R., 53, p. 280).

Note regarding the treatment of ear canker in rabbits, F. E. BLAISDELL (*Science, 60 (1924), No. 1558, pp. 429, 430*).—The author reports finding that 3 per cent carbolized sweet oil sprayed or poured into the ear in sufficient amount to penetrate the paperlike structure which the mites (*Psorocoptes cuniculi*) construct is as effective as the kerosene spray, previously noted (E. S. R., 53, p. 82).

AGRICULTURAL ENGINEERING

Civil engineering geology, C. S. FOX (*London: Crosby Lockwood & Son, 1923, pp. XVI+144, figs. 80*).—This book, which is in three parts, presents considerable data of use to agricultural engineers. Part 1, on water supply and irrigation, contains chapters on general rainfall considerations, rivers and canals, reservoirs, infiltration channels and wells, and artesian conditions; part 2, on field operations, contains chapters on retaining walls, tunnels and shafts, stability of hillsides, quarrying and mining, and building sites; part 3, on building materials, contains chapters on mode of occurrence of rocks, the principal rock groups, the common rock-forming minerals, the physical properties of rocks, and choice materials.

Engineering geology, H. RIES and T. L. WATSON (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1925, 3. ed., rev., pp. VII+708, pls. [4], figs. [409]*).—This is the third edition of this book (E. S. R., 35, p. 489).

The Federal Power Commission: Its history, activities, and organization, M. CONOVER (*Inst. Govt. Research, Serv. Monog. U. S. Govt. No. 17 (1923), pp. XI+126*).—The history, activities, and organization of the Federal Power Commission are described in this monograph.

Water-power investigation of Deep River, T. SAVILLE (*N. C. Geol. and Econ. Survey, Econ. Paper 54 (1924), pp. 43, pls. 18*).—This report presents and analyzes data obtained from a water-power investigation of Deep River in North Carolina, and presents a comprehensive plan for the development of the entire river, looking toward the interconnection of present and future hydro- and steam plants on the river.

A bill to provide for the protection and development of the lower Colorado River basin (*U. S. Senate, 68. Cong., 2. Sess., Com. Irrig. and Reclam., Hearings on S. 727, pts. 1 (1925), pp. III+221; 2, pp. II+223–320*).—The text of the hearings is given.

Major problems in a study of the irrigation of rice by pumping, D. G. CARTER (*Agr. Engin., 6 (1925), No. 2, pp. 37–40*).—In a contribution from the University of Arkansas an analysis is presented of the more important research features involved in a fundamental study of the irrigation of rice by pumping. Special attention is drawn to the importance of considering meteorological, soil, and economic factors in the provision of a foundation for studies to develop irrigation practices.

Cost of water to irrigators in California, H. F. BLANEY (*Calif. Dept. Pub. Works, Div. Engin. and Irrig. Bul. 8 (1925), pp. 66, figs. 20*).—Data gathered under a cooperative agreement between the U. S. D. A. Bureau of Public Roads, the California Experiment Station, and the California State Department of Public Works on the cost of water to irrigators under various types of irrigation enterprises in California are presented and discussed.

Irrigation farming in New South Wales, A. N. Shepherd (*N. S. Wales Dept. Agr., Farmers' Bul. 148 (1925), pp. 57, figs. 26*).—This bulletin deals with the planning of an irrigation farm, soil improvement and crop rotation, and the growing of different crops under irrigation.

Relation of water table to flow line of drains, J. T. Stewart (*Jour. Amer. Peat Soc., 18 (1925), No. 2, pp. 39–44, figs. 6*).—Data are presented which led to the conclusion that under ordinary soil conditions and characteristics the depth of the water table may be expressed by the depth of ditch grade below surface elevations. The depth of water table as indicated by an observation well may vary considerably from that computed from ditch grades. A number of observation wells at frequent intervals in close proximity to the drains are necessary to determine the position of the water table at any given time. The water table does not adjust itself to ditch grades as readily in fine textured soils as in coarse textured soils, and the movement of soil moisture is very slow in wet peat and very rapid in dry peat. When the water table in peat soil is lowered to the point where capillarity can not raise sufficient moisture to the surface, the soil is overdrained.

Development of marl excavating equipment, H. H. Musselman (*Agr. Engin., 5 (1924), No. 12, pp. 273, 274, figs. 3*).—In a contribution from the Michigan Agricultural College data are briefly reported on the development of marl excavating equipment. The most promising results from the mechanical standpoint were obtained from pumping, although considerable investment and overhead cost for operating were involved. Since the ordinary methods of agitating were not satisfactory for pumping, a special agitator was developed consisting of a rotating propeller-like cutter surrounded by a large hood attached to the end of the suction pipe.

It was further found that where a large investment for equipment in large sizes is permissible the slackline cableway excavator could be installed. It was necessary with this equipment to control the depth to which the bucket cuts, and to empty the bucket when loaded with the extremely sticky material.

The sliding of metal over soil, M. L. Nichols (*Agr. Engin., 6 (1925), No. 4, pp. 80–84, fig. 1*).—In a contribution from the Alabama Experiment Station studies are reported on the fundamental factors governing the friction between soil surfaces and polished metal surfaces moving through the soil, the purpose being to develop fundamental principles to provide a basis for the design of tillage machines.

It was found that in a dry soil, in which the coefficient of spreading of the soil solution was negative and in which the bearing power was less than the pressure, the sliding friction varied with the speed and with the smoothness of the metal surface and materials of its construction, and was proportional to the pressure per unit area. When the bearing power of a soil was greater than the pressure per unit area and the value of the coefficient of spreading of the soil solution was negative, the magnitude of the friction was proportional to the total pressure between the two surfaces, depended upon the roughness of the metal surface and the materials of its construction, and was independent of the area of contact and the speed of sliding.

When there was enough moisture present to cause the soil to adhere to the sliding metal surface, but not enough to leave moisture brought to the surface, which corresponded to a positive value of the coefficient of the spreading of the soil solution, the friction varied with the speed, the area of contact, the pressure per unit area, and with the surface tension of the film moisture, thus depending upon the amount of colloidal matter and water present and upon the temperature and viscosity of the soil solution. When there was enough moisture present to give a lubricating effect, the friction varied with the pressure

per unit area, the speed, the amount of moisture and viscosity, and the nature of the metal surface and the materials of its composition.

These results are taken to indicate that the coefficient of sliding friction in soil is a dynamic and constantly varying factor, and that in any soil it is affected by moisture content and particle size. The practical application of these results to the design of moldboards for specific conditions is discussed.

Soil colloids and tillage, R. W. TRULLINGER (*Agr. Engin., 6 (1925), Nos. 3, pp. 61–63; 4, pp. 84–87*).—An analytical review is presented of studies of tillage and tillage machinery on the one hand and of the physico-chemical factors in soils which may affect tillage on the other. Attention is drawn to the possible relation between these two, the purpose being to provide a basis for further and more fundamental studies of the factors governing tillage to provide principles for the development of tillage machinery.

A list of 90 references is appended.

Cultivation of crops on peat or muck land, G. R. B. ELLIOTT (*Jour. Amer. Peat Soc., 18 (1925), No. 2, pp. 25–35, figs. 5*).—In a contribution from the Minnesota Experiment Station, data on the cultivation of crops on peat or muck land are presented, special attention being drawn to the influence of drainage. It is shown that corn roots, for instance, do not penetrate to the water level in such soils but spread out at a definite zone, some 18 in. above the water level. The influence of this on the establishment of water levels is discussed.

Highway engineering, J. W. GREEN and H. P. H. MORGAN (*London: St. Bride's Press, Ltd., 1924, pp. [5]+295+[4], figs. 20*).—Following an introductory and historical chapter, this book contains chapters on maps, physical features, embankments, cuttings, setting out roads, and dangerous corners; surveying and leveling; bridges, culverts, and retaining walls; drainage; foundations; water-bound macadam; rolling, scarifying, and camber; tar macadam; asphalt roads; paved roads and wood blocks; grouted roads; concrete roads; corrugations; and footpaths.

The economics of road transport, K. G. FENELON (*London: George Allen & Unwin, Ltd., 1925, pp. 256*).—Following an introduction and historical survey, this book contains chapters on recent development of road transport; road transport of goods and merchandise; types of vehicle—their special economic characteristics and advantages for the transport of goods and merchandise; the organization of road transport of merchandise; the motor car, the motor cycle, and the taxicab; the motor coach; rural transport; city transport; the motor bus; the tramway; the railless trolley omnibus; road transport rates and fares; competition and monopoly in road transport; the railways and road powers; the road; and taxation of road vehicles. An appendix on motor transport costs and records and a bibliography are included.

The grading of earth roads, V. OVERHOLT and C. H. HOOLEY (*Ohio Agr. Col. Ext. Bul., 20 (1924–25), No. 5, pp. 18, figs. 20*).—Practical information on the grading of earth roads is presented.

A process for preserving wood [trans. title], R. CHAVASTELON (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 17, pp. 1178, 1179*).—Experimentation over 12 years with a wood preserver made up of 6 per cent copper sulfate with 6 per cent potassium or sodium bichromate (both heated before mixing but allowed to cool before using) proves this to constitute an efficient preserver of different woods under various trying conditions, the products of the chemical action filling the pores with a slowly soluble deposit to exclude moisture and to supply an available reserve of protective fungicide. The wood may be dipped or painted with the fungicide. Most metal containers are unsuited to holding the preserver, but wood, glass, or glazed ware are unaffected.

The fundamental cause of the disintegration of concrete, A. H. White (*Concrete* [*Detroit*], *26* (*1925*), *No. 5*, *pp. 157–161*, *figs. 7*).—The results of a large number of studies are summarized, indicating that alternate expansion and contraction due to changes in moisture is the greatest underlying cause of the destruction of concrete structures, since the strains due to the volume changes produced by variations in the water content are usually far greater than those due to changes of temperature. If concrete is to be permanent, its moisture content must remain relatively constant, the absolute quantity of combined water being relatively immaterial. The greatest trouble is found in concrete exposed to the weather when the moisture content of the surface changes much more rapidly than that of the interior, resulting frequently in a differential expansion and shearing stress.

Portland cement prices: Their basis, character, and present position, H. P. Willis and J. R. B. Byers (*New York: Ronald Press Co.*, *1924*, *pp. VII+123*, *pl. 1*, *figs. 16*).—A detailed analysis is given of the current position of prices and price levels in the Portland cement industry.

Studies on the industrial dust problem.—II, A review of the methods used for sampling aerial dust, L. Greenburg (*Pub. Health Rpts.* [*U. S.*], *40* (*1925*), *No. 16*, *pp. 765–786*).—Several methods and the accompanying apparatus are described.

Reclamation of automobile crank-case oil, C. Van Brunt and P. S. Miller (*Indus. and Engin. Chem.*, *17* (*1925*), *No. 4*, *pp. 416–423*, *figs. 4*).—Experiments are reported which showed that by treating the used oil from crankcases while hot with a small quantity of a concentrated solution of sodium silicate, usually preceded by the addition of a metal resinate and stearic acid, a sludge is formed which carries all solid and other deleterious impurities, and which not only settles in a few minutes but sinks completely into an underlying body of water. The diluents are removed by a supplementary heating in a thin film. An apparatus for carrying out the process automatically and continuously in units adaptable to ordinary service has been devised.

Farm motors, A. A. Potter (*New York and London: McGraw-Hill Book Co., Inc.*, *1925*, *3. ed.*, *rev. and enl.*, *pp. XII+299*, *figs. 279*).—This is the third revised and enlarged edition of this book (E. S. R., 31, p. 186).

An electric sterilizer for the average-sized dairy (*Jour. Elect.*, *54* (*1925*), *No. 9*, *p. 323*, *figs. 2*).—This apparatus is described and illustrated, and data on its operation are briefly presented. It consists of a 30-gal. boiler placed over a heating chamber containing a 5-kw. hairpin heating element. A sheet-metal sterilizing chamber, large enough to hold four 10-gal. cans, is placed adjacent to the boiler. Live steam may be generated at any desired pressure up to 75 lbs., at which point a safety valve is set to operate.

Milk houses for California dairies, H. L. Belton and J. D. Long (*California Sta. Circ. 286* (*1925*), *pp. 37*, *figs. 19*).—Practical information on the planning and construction of milk houses for California dairies is presented, together with numerous plans.

American Society of Heating and Ventilating Engineers Guide, 1924–25 (*New York: Amer. Soc. Heating and Ventilating Engin.*, *1924* [*3. ed.*], *pp.* [*6*]*+458+52*, [*pl. 1*], *figs.* [*85*]).—This is the third edition of this handbook, containing the usual technical and commercial data.

Value of fans in furnace heating, C. G. Buder (*Jour. Amer. Soc. Heating and Ventilating Engin.*, *31* (*1925*), *No. 6*, *pp. 349–352*, *figs. 2*).—Studies are reported showing that the efficiency of a furnace is increased doubly by forced circulation, due to the decreased surface resistance caused by the greater air velocity and to the greater difference in temperature between the furnace and

surrounding air. In addition to preventing stratification, the fan helps to insure better distribution to all parts of the building and thus aids in preventing air stagnation.

The septic tank, R. R. GRAHAM (*Ontario Devl. Agr. Circ. 46 (1925), pp. 8, figs. 5*).—A description is given of a septic tank adaptable to Ontario conditions, together with plans and specifications for its construction and installation.

RURAL ECONOMICS AND SOCIOLOGY

General principles of agricultural business organization, F. AEREBOE (*Allgemeine Landwirtschaftliche Betriebslehre. Berlin: Paul Parey, 1923, 6. ed., rev., pp. XVI+697, figs. 8*).—This treatise has to do exclusively with agriculture as a private business, and it is intended to show how the farmer may derive the highest possible and most permanent revenue from his property. The discussion is presented in this edition in sections dealing with the factors of production and the branches of business, farm organization or the combinations of the factors, business management and the direction of personnel, and net returns and the relation between profits and the degree of intensity of the farming system.

[Labor requirements, and costs, profits, and losses at Williston (N. Dak.) Substation, 1923 and 1924], A. C. KUENNING (*North Dakota Sta. Bul. 190 (1925), pp. 33–35*).—The labor requirements per acre and other data are tabulated for the principal crops grown on the irrigation demonstration farm unit.

Investigations with reference to the profits of agriculture during 1922–23 [trans. title], E. LAUR ET AL. (*Ann. Agr. Suisse, 25 (1924), No. 5, pp. 411–617*).—This annual report upon agriculture in Switzerland continues the series previously noted (E. S. R., 51, p. 592).

The business management and profits of beekeeping in 1923 [trans. title] (*Landw. Jahrb. Schweiz, 38 (1924), No. 4, pp. 475–498*).—Eighty-nine records for the year ended March 31, 1924, are analyzed, and comparisons are drawn with returns for the period from 1912 to the current year, continuing the report previously noted (E. S. R., 51, p. 593).

Farm tenancy in the United States, 1920, E. A. GOLDENWEISER and L. E. TRUESDELL (*U. S. Bur. of the Census, Census Monog. 4 (1924), pp. 247, figs. 15*).—Census schedules and data from other sources, including special studies in selected areas, are drawn upon in the preparation of this census monograph. The comment and interpretation of statistical data are presented with summary tables in an introduction and chapters on the growth of farm tenancy, 1880 to 1920; significance of the increase in tenant farms and in leased land; tenancy and type of farming; geographic distribution of tenancy; tenancy and farm values; tenancy and the speculative element in landownership; race and nativity of farm tenants; tenancy and farm income; the agricultural ladder—farmers by age; the agricultural ladder—farm experience; the agricultural ladder—special surveys; types of tenancy; stability of tenure; and conclusions. Census data are tabulated by States in general tables, and certain items are also shown by counties (pp. 143–247).

The problem of small occupying ownership in Argentina, E. FERRARI (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 3, pp. 377–395*).—The author calls attention to the trend of opinion with reference to a national policy of creating small holdings and encouraging land settlement in Argentina.

Share tenancy in France, M. BEAUFRETON (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 3, pp. 317–342*).—The author sets forth the history

and extent of share tenancy in France, describing the customary clauses in the renting agreement. The war is said to have accentuated the tendency of share tenants to organize. Certain colonization experiments are described. Examples are given of forms of agreement.

The maintenance of the agricultural labour supply in Scotland during the war, J. M. Ramsay (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 3, pp. 396–412*).—Particulars are given of the special circumstances existing in Scotland and of the methods of carrying out the general scheme of maintaining the agricultural labor supply under those circumstances.

Rural banks in Germany, F. J. Rohr (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 3, pp. 343–369*).—The organization, the working resources, the employment of working capital, and the place of the rural banks in federations and other central institutions are discussed here.

Land-value policy, J. D. White (*London: United Com. for Taxation of Land Values, 1924, pp. XX+205*).—The author advocates a policy of taxing land values and relieving taxes on improvements.

The Jewish Agricultural Society, Inc.: Report for the period 1900–1924, G. Davidson (*Jewish Agr. Soc. Rpt. 1900–1924, pp. 69, pls. 12*).—This is a review of 25 years' activities of this society, including the annual report which continues the series previously noted (E. S. R., 50, p. 894).

Agricultural cooperation in western Canada, W. A. Mackintosh (*Kingston, Canada: Queen's Univ., 1924, pp. IX+173, pls. 4*).—The author sets forth the history of cooperative marketing and early experiments in Government ownership, describing cooperative elevator companies and other enterprises, including grain companies and organizations for marketing livestock, cream, and wool, and purchasing supplies. The study is confined to the three provinces of Manitoba, Saskatchewan, and Alberta.

Control of agricultural produce, E. M. H. Lloyd (In *Experiments in State Control. Oxford, Eng.: Clarendon Press; New York: Humphrey Milford, 1924, pp. 331–346*).—This is a chapter from a study tracing the evolution of war-time controls in Great Britain. The difficulties of price fixing in agriculture and phases of the economic effect of a guaranteed fair price, which is both maximum and minimum, are pointed out and problems of allowing for differences in quality under a system of fixed prices are touched upon. The guaranteed fair-price policy is said to deserve further examination by economists. Cooperative marketing was found not to be strong enough in general to play a large part in the organization of food control.

Forecasting the acreage of cotton, B. B. Smith (*Jour. Amer. Statis. Assoc., 20 (1925), No. 149, pp. 31–47, figs. 2*).—The factors which influence the farmer's opinion as to crop probability are outlined, and methods of determining the quantitative relation existing between these factors and the acreage planted are presented.

From an analysis of prices there was found to be practically no difference between the New Orleans and New York price series. With the exception of the November series the fluctuations in price series prior to 1907 were considerably greater in proportion to the acreage series than subsequently, when the ratio seemed to be fairly constant. If the acreage figure was below the price for one month, a similar condition prevailed for the other months in the related year. January and February were found to have probably closer relation to acreage than other months except November. The influence of the passage of time was provided for in mathematical analyses, but the net correlation was so small that in later analyses it was omitted. Examination of the coefficients of determin[illegible] were more important than

the production and yield value, or that prices had more to do with determining the producers' mind than the other factors.

Average monthly middling spot quotations on the New York and New Orleans markets for the harvest years 1901 to 1923, inclusive, and data with respect to production, yield, and acreage in the same years were used in this study.

Hog prices, H. C. Filley (*Nebraska Sta. Bul. 208 (1925), pp. 29, figs. 8*).—The forces affecting hog prices are set forth as including supply and demand, cost of production, market strategy, monopoly, the quantity of money in circulation and rapidity with which it circulates, credit, transportation costs, commercial costs, and import duties. Corn and hog ratios, monthly and yearly variations in hog receipts and hog prices in the United States, pork exports, and cycles of hog production through periods of the years are then tabulated, graphically presented, and briefly discussed.

Grains—wheat, corn, and oats (*Bur. Ry. Econ. [Wash., D. C.], Commodity Prices [etc.] Bul. 1 (1924), pp. 7, figs. 4*).—This one of a series of studies of commodity prices in their relation to transportation costs presents the relationship between the prices received by the producer of wheat, corn, and oats and the freight rates on these commodities to market. The results tend to indicate that the fluctuation of farm prices upward or downward is due entirely to causes beyond the influence of local freight costs. This stndy covered the period from August 17 to December 28, 1923.

Wheat (*Bur. Ry. Econ. [Wash., D. C.], Commodity Prices [etc.] Bul. 7 (1925), pp. 12, figs. 4*).—This bulletin extends the study noted above to include the period from August 17, 1923, to January 16, 1925.

Developments in the wheat situation, August to December, 1924, J. S. Davis et al. (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 3, pp. 77–120, figs. 2*).—The main points hrought out in this discussion are that the world wheat crop, without considering the Russian, is only slightly less than the crops for 1921 and 1922 but considerably below the 1923 crop and is of lower average quality than usual. The world crop of rye is relatively shorter than the wheat crop, and wheat substitutes are not sufficiently abundant to offset the shortage. Europe's financial position and economic outlook have improved, but prevailing high prices tend to keep imports as low as possible. There is only a narrow margin between the maximum probable exports and the minimum probable imports. The close adjustment between supplies and requirements and the high price level contribute to especially sensitive quotations. The appendix consists of seven tables showing production, apparent domestic utilization, visible wheat supplies, receipts, and prices in recent years.

Current sources concerning wheat supplies, movements, and prices, B. Stewart et al. (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 2, pp. 61–76*).—This is a selected bibliography confined to official and unofficial sources of current information with reference to the principal exporting and importing countries, although some sources not strictly periodical in nature are included. They are classified into four groups relating, respectively, to the world situation, the United States, the other principal wheat-exporting countries, and the principal importing countries.

Methods of merchandising American wheat in the export trade.—I, Buying wheat for export, T. D. Hammatt (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 183 (1924), pp. II+74, figs. 10*).—This bulletin deals with the methods now employed by exporters and other intermediary agents buying American wheat to be exported through the Atlantic

ports and ports on the Gulf of Mexico. The handling of export grain at the lake ports is also set forth in detail.

Methods of merchandising American wheat in the export trade.—II, Selling American wheat abroad, T. D. HAMMATT (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 185 (1924), pp. II+78, figs. 2*).—The methods used by exporters in making sales of wheat abroad are described, showing the character of the transactions involved. The appendix (pp. 33–78) reproduces certain of the most important documents connected with the export grain business.

The farmers and the grain trade in the United States: An interpretation of the present pooling movement, J. E. BOYLE (*Econ. Jour., 35 (1925), No. 137, pp. 11–25*).—The author sketches the changes in the consumption, production, and distribution of wheat in the United States and defines and describes wheat pools and methods of organizing and operating them. They are said to be successful on a rising but not on a falling market. Their principal weaknesses are found in matters of delay in paying farmers, high costs of operation, speculative losses through holding, and big promises which can not be fulfilled. Data are presented in defense of the point of view that dumping does not break the price of wheat.

The Canadian wheat pools, C. R. FAY (*Econ. Jour., 35 (1925), No. 137, pp. 26–29*).—The three allied wheat pools of 1924 in Alberta, Saskatchewan, and Manitoba are briefly noted.

Marketing Canadian wheat, T. D. HAMMATT (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 251 (1924), pp. II+123, figs. 10*).—The author describes the system by which Canadian wheat is moved to the Atlantic seaboard and marketed abroad. The information was obtained largely in the fall of 1923.

The London corn market at the beginning of the nineteenth century, C. R. FAY (*Amer. Econ. Rev., 15 (1925), No. 1, pp. 70–76*).—This gives a historical account of the structure of the grain trade. The growth of the import trade of Great Britain stimulated the business of so-called jobbers, who bought grain in order to sell to retail consumers. The class became unpopular because the prolonged scarcity and mounting prices of the period contributed to their advantage.

Our debt and duty to the farmer, H. C. WALLACE (*New York and London: Century Co., 1925, pp. XIX+232, figs. 11, pl. 1*).—The nature of the agricultural depression which has existed since the summer of 1920 is set forth, together with its primary causes and its effect upon those who suffered from it. It is held that the farmer was not receiving a fair share of the national income either in the years of depression or before the war. Relief legislation of recent years is reviewed. The futility of relying on the hope of an expansion in the outlet to foreign markets and difficulties of effecting economies in production and in adjusting crop systems are pointed out. The proper rôle of the Government is thought to be to furnish information which farmers and cooperative organizations can not gain for themselves. Farm taxation is in need of revision, and freight rates on farm products and on the things the farmer buys must be reduced. Plans for controlling the ratio price of the exportable farm surplus are advocated.

The dispensability of a wheat surplus in the United States, A. E. TAYLOR, J. S. DAVIS, and K. SNODGRASS (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 4, pp. 121–142, figs. 2*).—This exposition is based upon the latest data available on March 7, 1925, and discusses the meaning and implications of wheat production on a domestic basis from the several standpoints of producers, manufacturers, distributors, and consumers. The elements of the

problem of America's wheat surplus, certain basic definitions, and the nature of American wheat exports are discussed. The questions are raised as to whether a wheat surplus is desirable as an insurance of the national food supply, whether it is agriculturally unavoidable, and whether it is indispensable to the business interests concerned with wheat. The conclusions are drawn that incidental exports of special classes of wheat and of cull wheats of milling types, together with exports of flour, may be expected to continue to some extent indefinitely. Unless artificial stimulus to wheat planting is provided, the same forces which were operating before the war to bring the United States to a domestic basis as far as representative milling wheats are concerned will continue progressively. The maintenance of an export surplus of wheat can not properly be urged as insurance against food shortage and is not essential to the maintenance of adequate stocks held by elevators, traders, flour mills, and bakers. The elimination of the exportable surplus of representative wheats would call for adaptations and reorganizations by millers and bakers, but it is held to be difficult to argue that the exportable surplus should be maintained and the natural readjustment of agriculture prevented in order to provide business for these interests or to minimize their readjustments.

Foreign import duties on wheat, wheat flour, meat, and meat products, F. W. FETTER and H. CHALMERS (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 233 (1924), pp. II+37*).—A detailed analysis is presented here of the history of official policy in the principal foreign markets with reference to the importation of certain American products from the period just before the war up to the spring of 1924. It is found that but few countries interpose serious difficulties in the way of high duties or restrictions on the importation of American cereals and meats, also that for the present these products are admitted at low or no duties into a number of important markets, and that there is little reason to expect a less liberal tariff treatment abroad than in the years before the war.

Farmers' mutual fire insurance in the United States, V. N. VALGREN (*Chicago: Univ. Chicago Press, 1924, pp. IX+186, figs. 6*).—Part 1 of this study is devoted to historical and economic outlines. The special problems of the size of the company, windstorm insurance, livestock insurance, inspection of risks, and classification are set forth, and chapters are given to some items of true and false economy, intercompany cooperation, and the economic significance of farmers' mutual insurance. Part 2 contains suggested legal and business forms.

Rural Pennsylvania, R. L. WATTS (*New York: Macmillan Co., 1925, pp. XVII+331, pls. 8, figs. 34*).—This book is one of a series of which the first was noted (E. S. R., 45, p. 291).

The agricultural situation in Roanoke and its trade territory, J. J. VERNON and H. I. RICHARDS (*Virginia Sta. Bul. 240 (1925), pp. 70, figs. 31*).—In this analysis of the agricultural production and distribution of the trade territory surrounding Roanoke, Va., and its best adjustment to meet home-market demands, the quantity of farm products consumed in the city was obtained from a review of railroad receipts and shipments and an estimate of the receipts of local products based on a production survey of 582 farms. The first part of this report takes up the characteristics of the consuming population, the trend and stability of employment and industrial income, the distributing agencies for food products, and an analysis of the curb market, while the second part deals with the production, consumption, and marketing of those products which seem to present the most favorable opportunities for a change with profit to the producer.

Rural standards of living in the South, R. M. Harper (*Jour. Social Forces, 2 (1923), No. 1, pp. 13–17; 2 (1924), No. 2, pp. 253–265, figs. 5*).—It is held that rural standards of living do not necessarily vary as the fertility of the soil. Census data through several decades are reviewed in order to bring out the cultural conditions characteristic of several distinct regions in the Southern States. The percentage of improved land and of white farmers and the value of land and buildings per farm for whites and negroes and other items are set forth statistically and graphically.

Land and agriculture (In *Mexican Year Book, 1922–1924. Los Angeles, Calif.: Times-Mirror Press, 1924, pp. 200–253, pl. 1*).—This is section 4 of a survey of the history, Government, geography, educational system, labor problems, and other information about Mexico. It includes an article describing the official grants known as concessions, by H. N. Branch, which is reprinted from an earlier yearbook, and another setting forth land legislation in Mexico, by H. I. Priestley, together with some statistical tables showing agricultural production from 1891 to 1922, but devoted principally to statistics for the recent years.

Agrarian and political peace in Ireland [trans. title], G. Valensin (*Atti R. Accad. Georg. [Florence], 5. ser., 21 (1924), No. 2, pp. 54–81*).—A review is given of agrarian legislation in Ireland in recent years, particularly with reference to the relief of congested districts and in aid of small holdings and the cooperative movement.

Reports of the Commission on Agriculture [of the Irish Free State], J. P. Drew et al. (*Dublin: Govt., [1924], pp. 115*).—The five interim reports of a committee appointed in November, 1922, by the Minister of Agriculture cover, respectively, tobacco growing, the marketing and transit of Irish agricultural produce—butter, the marketing and transit of Irish agricultural produce—eggs, agricultural credit, and the licensing of bulls. The final report is submitted as majority and minority reports.

Cropping systems of large and medium sized peasant holdings at the beginning of the twentieth century [trans. title], O. H. Larsen (*K. Vet. og Landbohøjskole [Denmark], Aarsskr. 1924, pp. 337–383*).—An investigation covering 8,082 large and medium sized peasant farm businesses in Denmark, including Jutland, is reported. Principal and secondary crop rotations are identified, and a number of combinations of cropping and fallow are classified, the extent to which each is followed being set forth.

An economic résumé, 1925, G. Mortara (*Prospettive Economiche, 1925. Milan: Univ. Bocconi, 1925, pp. XXIV+433, figs. 35*).—This report covering the year 1924 continues the series previously noted (E. S. R., 51, p. 94).

A national survey of agrarian customs [trans. title], G. G. Bolla (*Atti R. Accad. Georg. [Florence], 5. ser., 21 (1924), No. 1, pp. 1–27*).—The questionnaire is reproduced with which it is intended to gain information as to common usage in various sections of Italy in regard to landholding and other agricultural and social matters, surveying thereby technical, social, historical, and political conditions.

Changing factors in the economic life of China, J. H. Nelson (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 312 (1925), pp. II+21*).—Official statistical data supplemented by first-hand investigation in the field are presented, with discussion, and three important phases of the present economic status of China are pointed out. Her foreign trade is said not to have increased appreciably in the last decade.

The Chinese are developing in a limited way as a commercial and industrial group, and the economic status of the rural and agricultural population has

not improved within the last decade and in many sections has materially declined.

The results of a field study in a number of representative farm communities of north China are briefly summarized, as are also the returns from a study in central China noted below.

An economic and social survey of 102 farms near Wuhu, Anhwei, China, J. L. BUCK (*Univ. Nanking, Agr. and Forestry Ser., 1 (1923), No. 7, pp. 20, figs. 4*).—A student in the department of agricultural economics and farm management of the University of Nanking conducted this survey during the summer of 1922.

Of the farms surveyed 55 per cent were tilled by owners, 32 by part owners, and 13 by tenants. The labor income of owners for the year ended April 30, 1922, was —$15 (Mexican = $7.50), that of part owners $156, and of tenants $105. The labor income from farms with land valued at $100 or less per mow (about 0.15 acre) was $45, from those with land valued at $101 to $125 was —$6, and from those with land valued at $126 or over —$13.

Thirty years of Swedish agriculture [trans. title], LICHTENFELT (*Landw. Jahrb., 60 (1924), No. 6, pp. 833–846*).—A statistical review of yields, numbers of livestock, wages and working hours, the amount of labor spent in various branches of the farming business, outlay and returns, and miscellaneous items is given in these pages.

Drovers Journal year book of figures of the live-stock trade, [1923 and 1924] (*Chicago: Daily Drovers Jour., 1924, 23. ed., pp. 108; 1925, 24. ed., pp. 111*).—These yearbooks show statistics of livestock, grain and other important farm products, and receipts at the Chicago markets and other points, continuing the series previously noted (E. S. R., 48, p. 894).

The proceedings of the Seventh General Assembly [trans. title] (*Inst. Internatl. Agr. [Rome], Actes 7. Assemblée Gén., 1924, pp. XIV+870*).—Parts 1 to 3, inclusive, of this report give the program, the list of delegates, the personnel of committees, and the minutes of open sessions and committee meetings making up the general assembly of the International Institute of Agriculture, held in Rome, May 2–8, 1924. Part 4 presents the signed reports with reference to improvement of the statistical and other services of the institute and miscellaneous items.

AGRICULTURAL EDUCATION

Proceedings of the thirty-eighth annual convention of the Association of Land-Grant Colleges, edited by W. H. BEAL (*Assoc. Land-Grant Cols. Proc., 38 (1924), pp. 472, figs. 14*).—The personnel lists, committee reports, and the minutes of general sessions and of the several sections of the convention, held in Washington, D. C., November 12–14, 1924, which was discussed editorially (E. S. R., 52, p. 1), are published here. The bibliographer's report, as presented by A. C. True, consists of a partial index of subjects in the proceedings of the Association of Land-Grant Colleges, 1885–1923. The other addresses and papers, with discussions thereon, are as follows: The Great Responsibility of Land-Grant Institutions, by R. A. Pearson; discussion of the presidential address, by B. Knapp, E. A. Hitchcock, and L. Stanley; American Council of Education, by D. A. Robertson; President Walter Merritt Riggs, by C. A. Lory; address by the President of the United States; The Late Henry C. Wallace, Secretary of Agriculture, by H. M. Gore; Elimination of Waste in Industry, by E. E. Hunt; Some Demands of Method on Curriculum Making, by W. H. Kilpatrick; The Problem of Vocational Guidance in the Colleges of Agriculture, by E. M. Freeman and F. D. Farrell; What Is Needed

for Success in Technical Fields besides Research and Education, by E. Davenport; Research Work of the Department of Agriculture, by E. D. Ball; Extension Work of the Department of Agriculture, by C. W. Warburton; Regulatory Work of the Department of Agriculture, by R. W. Williams; The Building of an Agricultural Curriculum to Meet Present-day Needs, by E. J. Kyle; Capitalizing an Agricultural College Education, by S. B. Haskell; Some Results from Applying the Principle of Job Analysis to Agricultural Teaching, by M. F. Miller; Spending the Dollar Wisely in Home and Community, by C. J. Galpin; Conservation of Natural Resources, by W. B. Greeley; The Scope and Function of Experiment Station Reports under Present-day Conditions, by F. B. Morrison, E. W. Allen, E. C. Johnson, A. Boss, and F. B. Mumford; The Handling of Research Projects, by F. D. Farrell; Testing the Proposal of the Project Leader, by J. G. Lipman and C. A. McCue; Changing the Plan of Emphasis of the Station Project, by E. A. Burnett and B. Youngblood; Experiment Station Leadership in Economic Problems, by T. Cooper; Land Valuation and Our Agricultural Future, by R. T. Ely; What European Conditions Mean to American Farmers, by E. G. Nourse; Status of Cooperative Marketing in the United States, by L. S. Tenny; Ten Years of Extension Work under the Smith-Lever Act, 1914–1924, by C. B. Smith; The Formation of the State Farm and Home Program, by P. V. Maris; Effective Procedure in Carrying Forward a Farm and Home Program, by H. W. Mumford; The Problems of the Teaching Staff, by J. W. Votey, E. J. McCaustland, A. A. Potter, and J. R. Benton; How Far Should Outside Work by Members of the Teaching Staff Be Permitted or Encouraged? by E. H. Rockwell, H. S. Boardman, S. B. Earle, O. M. Leland, and A. H. Fuller; Superpower and the World Power Conference, by W. S. Murray; Cooperation of Land-Grant Colleges of Engineering with State and Municipal Departments, by O. M. Leland, G. A. Covell, A. N. Johnson, F. H. Sibley, G. W. Bissell, and J. S. A. Johnson; Cooperation with Local Organizations, by O. J. Ferguson, C. H. Crouch, E. B. Norris, R. A. Seaton, and R. L. Wales; Cooperation in Development and Conservation of Natural Resources of the State, by E. A. Hitchcock, J. R. Benton, C. E. Ferris, W. N. Gladson, A. H. Fuller, J. S. A. Johnson, and C. R. Jones; Cooperation and Alliance with State Industries, by R. L. Sackett and G. W. Bissell; What Is the Field of Research in Home Economics? by R. W. Thatcher; The Field of Research in the Economics and Social Aspects of Home Economics, by H. Kneeland; Opportunities in Textiles and Clothing in the Field of Research in Home Economics, by R. O'Brien; Summary of Research in Home Economics Thus Far Accomplished by Land-Grant Colleges, by L. Stanley; Financing Home Economics Research, by A. E. Harris; The Present Status of the Purnell Bill and the Effect of Its Passage on the Development of Research in Home Economics, by A. F. Woods; Home Economics Curricula in Land-Grant Colleges, by J. Krueger; Teacher Training in Home Economics and the Needs in the Field, by A. S. Baylor; Trends in Home Economics Curricula, by C. M. Winchell; and Some Means to Use in Determining the Home Economics Curriculum, by A. L. Edwards.

Report on agricultural and small holdings schools for 1922 [trans. title] (*[Norway] Landbr. Dir. Årsberet., Tillegg L, Beret. Landbr. og Smdbrukesskol., 1922, pp. 32*).—This section of the annual report of the Director of Agriculture for Norway supplements information noted earlier (E. S. R., 48, p. 795).

Report of State schools for teachers of home economics for 1923–24 [trans. title], B. Torp (*[Norway] Landr. Dir. Beret., Tillegg M, Beret. Statens Laererinneskole Husstell, 1923–24, pp. 22*).—This report from Norway succeeds one for the earlier year (E. S. R., 51, p. 492).

Beef calf club manual, W. H. SMITH and R. R. SNAPP (*Illinois Sta. Circ. 296 (1925), pp. 26, figs. 21*).—The organization of boys' clubs for teaching the fundamentals of handling beef cattle is set forth, and methods of selection, feeding, care, and showing a beef calf are recommended.

Extension work in agricultural engineering, 1923, G. ERVIN (*U. S. Dept. Agr., Dept. Circ. 344 (1925), pp. 10, figs. 5*).—Extension activities in the way of demonstrations of drainage, the prevention of erosion, the construction of farm buildings, the installation of farm home conveniences, irrigation, land clearing, and the use, care, and repair of farm machinery are reported upon.

MISCELLANEOUS

Work of the Northern Great Plains Field Station in 1923, J. M. STEPHENS ET AL. (*U. S. Dept. Agr. Bul. 1337 (1925), pp. 18, fig. 1*).—The experimental work reported from this station, located near Mandan, N. Dak., is for the most part abstracted elsewhere in this issue.

Farming practices for the cut-over lands of northern Idaho, G. R. McDOLE and J. H. CHRIST (*Idaho Sta. Bul. 136 (1925), pp. 23, figs. 2*).—The experimental work reported in this bulletin is for the most part abstracted elsewhere in this issue.

Annual Report of [Louisiana Stations], 1924, W. R. DODSON (*Louisiana Stas. Rpt. 1924, pp. 55*).—This contains the organization list, a financial statement for the fiscal year ended December 31, 1924, and a report by the director, including brief departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue. Meteorological data and demonstrations on the cost of production of cotton, corn and soy beans, and corn and velvet beans are also briefly noted.

Fact-finding for northwestern North Dakota farming—1908–1924, A. C. KUENNING (*North Dakota Sta. Bul. 190 (1925), pp. 36, figs. 7*).—The experimental work noted in this report of the superintendent of the Williston Substation is for the most part abstracted elsewhere in this issue.

Forty-third Annual Report of [Ohio Station, 1924], C. G. WILLIAMS (*Ohio Sta. Bul. 382 (1924), pp. 68, figs. 20*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, and a report of the director summarizing the work of the station during the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-fifth Annual Report [of Texas Station], 1922, B. YOUNGBLOOD (*Texas Sta. Rpt. 1922, pp. 15*).—This contains a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1922, and for various State funds for the fiscal year ended August 31, 1922.

Monthly Bulletin of the Ohio Agricultural Experiment Station, [March–April, 1925] (*Ohio Sta. Mo. Bul., 10 (1925), No. 3–4, pp. 33–64, figs. 6*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: When Should Sweet Clover be Plowed Down? by C. J. Willard; Infested Corn Stalks Should be Burned, by L. E. Thatcher; and Protected Woodlot Becomes Farm Asset, by E. Secrest.

Abbreviations employed in Experiment Station Record for titles of periodicals, compiled by F. A. BARTHOLOW (*U. S. Dept. Agr. Bul. 1330 (1925), pp. 160*).—This bulletin has been noted editorially (E. S. R., 53, p. 101).

NOTES

Maryland University and Station.—James A. Gamble, professor of dairy husbandry and dairy husbandman, has resigned to engage in commercial work.

Nevada Station.—The station has planned five studies as Purnell projects, dealing, respectively, with the reclamation of certain desert soils under irrigation from artesian wells in the Las Vegas Valley of southern Nevada, land utilization and farm development, the economics of cattle production under Nevada ranch and range conditions, a test of the economic efficiency of alfalfa hay as a sole ration for dairy cattle in western Nevada and of the relation of this ration to sterility, and the production cost and carrying capacity of grass pastures in western Nevada.

F. B. Headley, formerly superintendent of the Newlands Experiment Farm of the U. S. Department of Agriculture, has been appointed chief of the department of farm development, and J. J. McElroy scientific assistant in the same department.

North Dakota College and Station.—The college and station will be greatly benefited by a new trunk sewer now being constructed to serve the northern part of the city of Fargo. To facilitate the formation of a sewer district, the college campus was recently made a part of the city.

The resignations are reported of John Taylor, instructor and assistant in dairy manufactures, to enter commercial work at Detroit, Mich.; Louis Jorgenson, superintendent of the Langdon Substation, to take up graduate work in plant breeding at the University of Minnesota; R. S. Amadon, assistant veterinarian, to accept a position in the University of Pennsylvania; and Miss Wanda Weniger, assistant botanist and plant pathologist. L. M. Roderick, assistant veterinarian, is on leave of absence for study at Chicago University. Victor V. Sturlaugson of the Dickinson Substation has been appointed superintendent at Langdon, and W. E. Brentzel, of the U. S. Department of Agriculture, plant pathologist in the station. E. A. Willson of the extension department was added to the station staff September 1 to take charge with Dr. A. H. Benton of a project dealing with rural community studies.

Pennsylvania College and Station.—Frederick P. Weaver has been appointed head of the newly established department of agricultural economics. F. D. Kern, head of the department of botany and dean of the graduate school, has been granted a year's leave of absence ending July 1, 1926, and from September to June will serve as acting dean of the college of agriculture of the University of Porto Rico.

West Virginia University and Station.—K. S. Quisenberry, instructor in agronomy and junior agronomist in the station, resigned August 1 and was succeeded by M. M. Hoover. S. S. Wheeler, instructor in animal husbandry and junior animal husbandman in the station, resigned July 1 to accept a similar position in Wyoming. Troy M. Currence, instructor in horticulture and junior horticulturist in the station, has been given leave of absence beginning September 15 for graduate work at Cornell University. J. V. Ankney, professor of visual education, has been added to the staff of the College of Agriculture for the coming year. Robert B. Dustman has been appointed assistant chemist in the station, beginning August 1.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
10 CENTS PER COPY
SUBSCRIPTION PRICE, 75 CENTS PER YEAR
▽

EXPERIMENT STATION RECORD

Vol. 53 NOVEMBER, 1925 No. 7

The agricultural experiment station has become such an established institution that the history of its establishment and its early struggles for existence are easily forgotten. Fifty years is a relatively insignificant span of time in the history of an industry or the life of a nation, yet it covers the entire active existence of the experiment station in this country. The semicentennial of the establishment of the first American station is therefore an event of national as well as local interest.

Exercises commemorative of this important occasion were held on October 12, 1925, by the Connecticut Agricultural Experiment Station, the first to be organized in the United States by legislative action. The celebration took place on the station grounds at New Haven, and was attended by representatives from other stations of the Northeast, the U. S. Department of Agriculture, the Association of Land-Grant Colleges, and Yale University, and by others interested in the work of the station. The governor of the State, who is ex officio president of the board of control, presided and gave a brief address entitled The Agricultural Experiment Station and the State. Other addresses followed by Dr. E. W. Allen, Chief of the Office of Experiment Stations, and Dr. R. W. Thatcher, Director of the New York Experiment Stations. During the proceedings an excellent portrait of Dr. E. H. Jenkins, recently retired from the directorship of the station, was presented on behalf of his friends by Dr. Henry S. Graves, Provost of Yale University. In the evening a complimentary dinner was tendered Doctor Jenkins and his contemporaries, which was largely attended. Numerous speakers extolled the work of the station and its founders and paid high tribute of appreciation and affection to the leading figure of the occasion.

Further recognition of the event took the form of a handsome parchment testimonial from the Rothamsted Experimental Station, extending its greetings and felicitations, and a congratulatory letter from the Sheffield Scientific School commending the work of the station and expressing satisfaction that it had early had a connection with its history. In similar fashion Yale University honored

the occasion by the presence of its president and president emeritus and numerous members of its faculty.

It was a red-letter day for the station and the experiment station idea. It commemorated the first public expression by any State, as regards the industry on which all depend, in recognition of the power of research to free from error and guide to progress. But it was no less a celebration of accomplishment than of pioneering. As one of the speakers pointed out, in its development "the Connecticut Station was one of the first to take a broad view of research which reached into the fundamentals of science as a means for understanding the common things in agriculture. It set a standard for work which reveals not merely the bare facts but their real meaning and significance. It has dealt with simple things in a large way. What it has undertaken has been done in no superficial manner, but by digging deep to find out what lay back of the things seen, realizing that these are not themselves causes but manifestations. Its work has lived up to the declaration in an early writing of Doctor Johnson, that 'it is not the novelty or the glory of discovery, but the genuineness of discovery that is of first importance.' . . . It has helped to show the impracticability of half truths, and the permanent value of inquiry that is thoroughgoing."

The history of the station movement in Connecticut has often been recounted, yet is ever of interest. Its early advocates included Professors Samuel W. Johnson of Yale University and W. O. Atwater of Wesleyan University, and in 1874 their efforts crystallized into an appointment by the State Board of Agriculture of a committee with Professor Johnson as chairman to arouse the interest of farmers and others and bring the matter of establishing an experiment station before the Connecticut General Assembly. A period of agitation followed which disclosed that despite the merits of the project the great mass of the farmers took little interest in the enterprise. None the less it found many warm and enthusiastic friends, some of whom came to believe that if in some way the work of agricultural experimentation could actually be begun, its usefulness would be so clearly demonstrated that it would be continued. At this juncture, Mr. Orange Judd, the editor and proprietor of the *American Agriculturist*, offered to contribute $1,000 personally and, on the part of Wesleyan University, the free use of its chemical laboratory. These offers were conditional upon the appropriation by the State of $2,800 per annum for two years. An act making this appropriation was unanimously passed and received the approval of the governor on July 2, 1875. Professor Atwater was made director of the new station, thus located at Middletown, and in the following October operations were begun.

At the end of the two-year period, despite a severe financial depression, an act making a permanent annual appropriation of $5,000 "to promote agriculture by scientific investigation and experiment" was passed unanimously. By this act the station was reorganized under the direct control of the State, with Professor Johnson as director, and relocated in New Haven in the laboratories of the Sheffield Scientific School, then the recipient of the Morrill fund. Five years later the present site with laboratory and office was provided by the State in the suburbs of the same city.

The establishment of a State experiment station in Connecticut attracted the attention of advanced agricultural leaders throughout the country, and the example set was soon followed. North Carolina in 1877, New Jersey in 1880, and Massachusetts, New York, and Ohio in 1882 may be mentioned as among the States soon providing for experiment stations by legislative action. Even earlier experimental work had been provided for in California by the university board of regents in 1873, and subsequently somewhat similar action was taken by Cornell University, while in a number of other States experimental work was carried on in the colleges of agriculture in a more or less formally organized way.

In the organization of the Connecticut Station, as well as of several others, considerable stress was laid on the assistance which it could render along regulatory lines, and especially in the analysis of commercial fertilizers. Doubtless the thought uppermost with many farmers who urged the establishment of the station was that of its use in protecting from frauds in the sale of these commodities, and much of the early work was done in this field. A thorough, conscientious, and efficient system of fertilizer inspection was developed, which served as a model in many other States and did much to gain for the new institution the esteem both of farmers and of the makers of honest fertilizers. Upon this foundation was built a station renowned for the scope and high character of its defense work, subsequently extended to include feeding stuffs, seeds, insecticides, nursery stock, human foods and drugs, and other products of interest to agriculture and the general public. This service has been conducted with scrupulous and painstaking thoroughness, well exemplifying what Director Thatcher termed in his paper a conception of the experiment station "as an unbiased and unimpeachable fact-finding and truth-reporting agency for agricultural and public welfare."

But the station was not permitted to develop as either an exclusively control station or one content with the simpler and more immediately useful forms of testing work. This was due largely to the broad vision and high ideals of those in whose charge its destinies have been entrusted. The initial statement of Professor At-

water so many years ago reveals his wise understanding of the true function of an experiment station in the following language: "It has been felt from the first that more abstract scientific investigations would afford not only the proper but also the more widely and permanently useful work of the agricultural station. Such an institution will be worthy of the name in proportion as it carries on thorough investigation and experiment in agricultural science."

Likewise Director Johnson, a thorough scholar, imbued with the spirit of science as well as its practical applications, had for many years been preaching the advantages of agricultural investigation and had from the first high ideals for the field and function of the experiment station. In his view it must be above *all* a scientific institution, although its ultimate object was practical aid to the farming industry. This was consistently reflected in its work. Scrupulous care was exercised so to organize the inspection service that it would not hamper the progress of research, to rest it at all times on the soundest basis which science could provide, and to develop so far as possible the more fundamental investigations. This has resulted in the development of such fields as plant breeding and the biochemistry of the proteins, which have contributed in such impressive fashion to the station's renown.

Scarcely less important in the upbuilding of the station has been the continuity of policies which it has been able to maintain. The directorship of Professor Johnson covered a period of a quarter century and that of his successor Doctor Jenkins, twenty-three years, preceded by seventeen years as vice director and several years in addition as a member of the staff. This record has been well-nigh unparalleled in station history, but its results have been as fortunate as the opportunity has been rare. Great and lasting benefit has also been derived from the personality of these organizers and leaders, characterized during the exercises in the following happy fashion: "Johnson, who as teacher, writer, and advocate, occupied a foremost position and wielded an influence exceeded by none; Atwater, who had the enthusiasm and persistence to impress others and to carry him over periods of opposition and discouragement; Jenkins, whose whole career has been devoted to this institution, and who for some forty years carried forward its high traditions and created here, as he modestly puts it, 'an atmosphere and a somewhat comfortable place for research workers.' All honor to them!"

The address of Doctor Allen was entitled The Relation of the Federal Government and the State Experiment Stations, and this gave opportunity for a summary of the past and numerous constructive suggestions for the future. He pointed out that fifty years ago scientific activities of the Department of Agriculture were rep-

resented by allotments of $24,000 for the experimental gardens and grounds, $4,500 for the museum and herbarium, and $1,300 for the maintenance of a laboratory, and that "nowhere else were any public moneys provided for agricultural investigation." Not until twelve years later, when State after State had followed the example of Connecticut, was Federal aid forthcoming to provide stations. Concerning the passage of the Hatch Act he said, "this nation-wide subsidizing of research in agriculture was evidence of change which had come in the conception of the relationship of the Federal Government and the States. It was a recognition of a joint responsibility in developing the industry of agriculture on a high stage of efficiency, and it was a new expression of what the general Government may do under the Constitution for the promotion of public welfare."

That the new policy proved warranted is indicated by the supplementary legislation embodied in the Adams Act of 1906 and the Purnell Act of 1925. The passage of the new legislation, which when in full operation will provide each State with $90,000 per annum, or six times the original grant, was described as "a fitting climax for this anniversary year."

The relations of the Department and the stations have naturally been progressive with the growth of the enterprise. Concerning the administration of the Federal funds, which furnished the original point of contact, Doctor Allen drew attention to the consistent absence of desire by the Department "to assume any of the functions or responsibilities of the State in the management of the stations, or to determine the lines of work to be followed. There has been no suggestion of coercion or control, no purpose to dominate or subordinate, no stipulation of State appropriations. The stations are recognized by law as State institutions, and special effort has been directed toward maintaining their individuality and strengthening their organizations."

As time went on certain things were found to be more effectively attended to through a central agency. Considerable assistance was rendered in the shaping of policies and in guarding individual institutions from harmful interference. Much was also accomplished in the development of standards in a broad way, particularly during the formative period when there were "few leaders and many leaners" and consequently much imitation and duplication.

The passage of the Purnell Act has brought a further enlargement of relationships, with new standards and policies. Here there is evidently a responsibility for the selection of live projects on the basis of permanent as well as temporary and local needs. "The feeling that research is a creative function and not alone routine,

and certainly not demonstration, finds general acceptance, and it is guiding the Department and the stations in the development of plans under the new act."

The need of coordination in planning and procedure on the basis of what others have done and are doing was pointed out as a matter of increasing importance under the new conditions. Stress is therefore being laid, in passing on new projects, on a clear objective, a point of departure which takes account of the general status of knowledge in the subject, and a procedure which is adequate at the start. "The point of view and the method often will change as the investigation progresses, but at the outset it seems reasonable to expect that they should be *forward-looking* and *constructive*."

In a further attempt to promote this type of investigations under the new fund, more extensive cooperation in research is being strongly urged by Department and station people, and is more definitely in mind than ever before, although without repressing individuality and without dampening the incentive which comes from individual attainment. Such cooperation involves an extension of the Department's relations with the stations, as it has actively under way work in a number of subjects which lend themselves to cooperation. This, however, as was made clear, does not mean the assumption of direction or leadership, or any policy of coercion, "at least from the Department, anxious as it is that cooperation should have a fair trial and that much of its own work should be joined up with that in the States." What is suggested is an opportunity, and one which is especially inviting, in the newer fields of agricultural economics, home economics, and rural sociology, now that a period of rapid expansion is at hand.

Director Thatcher's paper bore the title of the Influence of Experiment Stations on American Agriculture. After an examination of the views of various leaders of the past, Doctor Thatcher defined the duty and opportunity of a State experiment station as "to contribute to the agriculture of the State and Nation such information concerning the problems of agriculture as can be ascertained by the scientific method of investigation rather than the results of practical experience in farm operation."

In this connection, however, he made a strong plea for the selection of materials for experimentation at the stations from those "which are of common occurrence and of practical use on the farms and in the orchards, etc., of our own State. The study, by the scientific method, of any problem in agricultural science or practice will, I believe, be as certain of giving accurate data for the solution of the problem in question, and at the same time will yield a fund of practical working information such as can not be secured if the materials worked with are foreign to our everyday working conditions.

For example, it seems to me that the study of a problem in plant breeding may better be carried on with wheat, raspberries, or some other economic crop and be so planned that the results of the investigation may yield an improved new strain of field or garden crops, than with larkspurs, sweet peas, or skunk cabbage. Similarly, other things being equal, I should prefer to use swine instead of guinea pigs for studies of animal nutrition, chickens instead of pigeons for studies of deficiency diseases, etc. To be sure, it is sometimes simpler and easier, and often cheaper, to use noneeonomic plants or animals for studies of general fundamental principles of heredity, nutrition, disease-resistance, etc. But as a general principle, it seems to me to be wise to have a definite economic improvement of the species, or some profitable end in view, at the same time that the data necessary from the establishment of the fundamental principle in question is being sought. In other words, I would have the station worker seek to secure fundamental scientific principles, but at the same time 'keep his feet on the ground' in choosing his material and planning his analytical studies."

Director Thatcher called attention to another matter of increasing importance in station work, the extent to which the staff is being removed from direct contaets with the farmers of the State by the sharper differentiation of the teaching and research functions, and particularly by the organization of the extension service. As he pointed out, in consequence, "There is a real serious difficulty confronting the station administration to keep alive any appreciative recognition of the source of the knowledge which is being imparted through extension teaching." There is also, as he said, "a real loss to the research worker if the lack of opportunity to present the constructive results of his studies diminishes his sense of responsibility to secure such results and of that achievement which comes from the presentation of these results to appreciative audiences."

These considerations are deserving of much reflective thinking.

The exercises at New Haven were notably forward-looking, with a minimum of reminiscence and retrospection. This was to have been expected, for in this they typified the spirit not only of the institution whose anniversary was commemorated but of the group of stations of which it is a part and the large family of research institutions as a whole. For such institutions, the achievements of the past, however worthy, must necessarily have less appeal than the lure of the unknown before them, and the paramount glory is the glory of discovery. The beginning of the new half century finds the stations well established, definite in their aims, and optimistic as to their future. That these things have come to pass, however, is due in no small measure to the care and foresight with which the foundations of the movement were laid.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Contribution on the nature of the antiscorbutic factor called vitamin C [trans. title], N. BEZSSONOFF (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 12, pp. 970–972*).—By slight changes in the method previously described (E. S. R., 48, p. 866) the author has prepared a much more active antiscorbutic product in crystalline form. The technique of the modified method is as follows:

One hundred liters of the juice of fresh cabbage are defecated with 40 liters of water containing 3,200 gm. of lead acetate and 1,600 cc. of acetic acid. The acid filtrate, which contains all of the vitamin C, is not freed from lead, but after concentration to one-fourth of its volume is brought to an alkalinity of pH 8.2 by the addition of sodium hydroxide. This results in the formation of a precipitate containing the vitamin. This is dissolved in 8 per cent acetic acid and the solution reprecipitated as before. The second precipitate is treated in the same manner. This gives three precipitates which, on drying at 40° C., weigh 1.5, 1, and 0.75 kg. and contain 65, 62.5, and 60 per cent of lead, respectively. After dilution the solution of the third precipitate is treated with hydrogen sulfide under pressure to precipitate the lead. The filtrate is evaporated to a pasty consistency in a vacuum at 25°, taken up in distilled water, and evaporated again, the operation being repeated four times. The liquid is then brought to a density of 1.1 and treated with 5 volumes of alcohol at 95°. The resulting precipitate is filtered and the vitamin-containing filtrate concentrated again, extracted with absolute alcohol, and the extract evaporated to dryness, taken up by absolute acetone, and again evaporated.

The extracts in alcohol and acetone give on evaporation colorless needle-like crystals which are hygroscopic and very easily oxidized. Two cryoscopic determinations of the molecular weight of these crystals have given results of 200 and 230. The melting point is about 47°. The product is composed of carbon 45.57, oxygen 48.24, and hydrogen 6.19 per cent. It is soluble in water in all proportions and insoluble in ether, benzene, and toluene. On oxidation a yellowish-brown quinone is formed which is very soluble in ethyl acetate, less soluble in benzene, toluene, and ethyl alcohol, slightly soluble in ethyl ether, insoluble in chloroform, and soluble in concentrated acids and alkalies. The aqueous solution does not give the author's color reaction (E. S. R., 49, p. 805), but this reaction is given by the oxidized substance. The minimum protective dose of the crystalline substance for guinea pigs is less than 2 mg. daily. The author concludes that the substance is a hydrocarbon giving a derivative with the reactions of orthodiphenol, and that the oxidation of this substance gives a quinone which seems to be a phenolic anthracene.

Solubilities of vanillin, C. E. MANGE and O. EHLER (*Indus. and Engin. Chem.*, *16* (*1924*), *No. 12, pp. 1258–1260, figs. 3*).—Data are presented in the form of tables and graphs showing the solubility of vanillin in alcohol and glycerol.

The solubility determinations were made synthetically by noting the temperature at which a weighed amount of vanillin just dissolved in a measured volume of solids and analytically by preparing a saturated solution of the vanillin in the solvent and determining the concentration by weighing the vanillin extracted from a known volume of the solution by ether. A third empirical method was also used in some cases. This consisted in making up a series of tubes of various concentrations of the vanillin in various concentrations of glycerol, warming to dissolve the vanillin, and noting the stability on cooling. From the data determined by the empirical method, curves were constructed showing the amount of vanillin which can be held in glycerol-water solution under the usual conditions for preparing and storing the commercial flavor.

A study of the factors involved in the formation of a difficultly soluble precipitate in vanillin solutions in concentrated glycerol and alcohol showed that the precipitate, which is a glyceride, is easily hydrolyzed and can be converted into glycerol and vanillin by adding water and heating. Water to the extent of about 7 per cent of the weight of the vanillin will prevent the formation of this compound.

The germicidal properties of chemically pure soaps, J. E. WALKER (*Jour. Infect. Diseases, 35 (1924), No. 6, pp. 557–566*).—Soaps prepared in the laboratory from chemically pure fatty acids have been tested for germicidal properties against various organisms by the phenol coefficient method.

The sodium and potassium soaps of the same acid did not differ greatly in germicidal properties. The soaps of the lower members of the series of fatty acids appeared to have no or only limited bactericidal properties. The salts of caprylic acid were the first in ascending series to show this property to a limited extent. The soaps of the higher acids were in general selective in their bactericidal action. *Staphylococcus aureus* was extremely resistant to all of the soaps tested. The pneumococcus was very susceptible to the action of the laurates, oleates, linoleates, and linolenates, being killed in 15 minutes by an approximately 1:50,000 solution of sodium laurate. The streptococcus, while not so susceptible, was destroyed by the same soaps. *Bacillus typhosus* was considerably more resistant to the action of all of these soaps.

The soaps of myristic, palmitic, and stearic acids were bactericidal for pneumococci, streptococci, and typhoid bacilli in about the same concentration. Of all of the soaps tested, the laurates are thought to possess the most general action as germicides, but the marked resistance of *S. aureus* limits the use of soaps as general antiseptics. As is true for other germicides, the soaps were found to be more active at higher temperatures than at room temperature.

An improved method for anaerobic cultures, G. E. ROCKWELL (*Jour. Infect. Diseases, 35 (1924), No. 6, pp. 581–586, figs. 3*).—On the principle that for successful anaerobic culture the presence of carbon dioxide is essential as well as the absence of air, the ordinary method of absorbing oxygen with pyrogallic acid and sodium hydroxide has been modified by using pyrogallic acid and 10 per cent sodium bicarbonate dissolved in water highly charged with carbon dioxide. Five experiments are reported, with photographs illustrating three of them, showing the more extensive growth of certain anaerobic organisms in the new medium as compared with other media.

The effect of Cl. sporogenes on Cl. botulinum, E. O. JORDAN and G. M. DACK (*Jour. Infect. Diseases, 35 (1924), No. 6, pp. 576–580*).—In an effort to explain the frequent failure of *Clostridium botulinum* to develop and produce toxin, a study was made of its growth and toxin production in suitable media in the presence of *C. sporogenes*. This comparison was made with both small and large numbers of organisms.

It was found that when *C. sporogenes* was considerably in excess of *C. botulinum* no botulinus toxin was formed, and only colonies of the *C. sporogenes* type were left. When the numbers of the two organisms were about equal there was a definite inhibition of *C. botulinum* toxin, and when *C. botulinum* was in excess toxin was formed in the same degree as when *C. sporogenes* was not present. On continued incubation in mixed cultures in which toxin had been formed, there was a tendency for the toxin to disappear, while corresponding pure cultures retained their toxicity.

It is concluded that under suitable conditions *C. sporogenes* may prevent the development of botulinus toxin altogether, diminish the amount produced, or cause the early disappearance of the toxin.

A new set of buffer mixtures that can be prepared without the use of standardized acid or base, I. M. Kolthoff (*Jour. Biol. Chem., 63 (1925), No. 1, pp. 135–141, figs. 3*).—The set of buffer mixtures described includes mixtures of 0.05 molecular succinic acid and 0.1 molar acid potassium phosphate (KH_2PO_4) with a pH range of from 3 to 5.8, and mixtures of 0.1 molecular primary potassium phosphate and 0.05 molar borax with a pH range of from 5.8 to 9.2.

Methods of purifying the original substances and preparing the solutions are given, with data on their accuracy.

The adsorption of indicator (cresol red) by serum in the spectrophotometric determination of the pH, E. F. Hirsch (*Jour. Biol. Chem., 63 (1925), No. 1, pp. 55–59, fig. 1*).—In attempts to apply to blood plasma the spectrophotometric methods suggested by Brode and by Holmes (E. S. R., 51, p. 611) for determining the H-ion concentration of liquids, it was found that the amount of indicator (cresol red) necessary for correct transmission values varies for different species and for different individuals of the same species. It is suggested in explanation that part of the indicator may be bound by some of the serum constituents, and that differences in the quantity of indicator bound by different sera may be associated with species specificity.

Notes on the determination of the acidity of soils by various methods, namely, the hydrogen ion concentration, Truog's test (sulphide of zinc), and Comber's reagent (potassium thiocyanate), R. Marloth (*So. African Jour. Sci., 21 (1924), pp. 270–274*).—In the author's experience in the analysis of South African soils of low humus content, the Comber method of determining acidity (E. S. R., 46, p. 615) does not give reliable results. One of the sources of error in this determination is thought to be the moisture content of the soil. The presence of even a small amount of moisture reduced the intensity of the color reaction. Moreover, some soils with the same pH values gave negative results and others positive with the Comber reagent. The Truog test (E. S. R., 43, p. 622) is recommended as convenient and sufficiently accurate for the farmer, and H-ion concentration determinations either electrometrically or colorimetrically for the chemist with a laboratory at his disposal.

Application of "formol titration" to the Kjeldahl method of estimating nitrogen, W. S. Shaw (*Analyst, 49 (1924), No. 585, pp. 558–565*).—In this application of the Sorensen formol titration method to the estimation of ammonia in the Kjeldahl method of determining nitrogen, the indicator selected as most suitable was phenolphthalein. In order to obtain stability at the end point, the solutions are left slightly acid before the exact neutralization, boiled vigorously to expel carbon dioxide, and cooled before continuing the neutralization. In place of neutralizing the formaldehyde solution, allowance is made for its free acidity previously determined on a 5-cc. sample. Before adding the formaldehyde to the solution of ammonium salts formed in

the digestion, the solution should first be brought to a definite end point of clear pink color with phenolphthalein by neutralizing carefully until a faint change from colorless to pink has taken place and then adding 1 drop of alkali. After the formaldehyde solution has been added, the neutralization is again conducted to the same end point.

Detailed directions are given for the use of this method with large and small amounts of material, and for its application to the micro-Kjeldahl method. The results obtained by the formol method and the ordinary distillation method are reported for a number of organic compounds. The differences in results by the two methods varied from —0.20 to +0.21 per cent.

The determination of the total nitrogen in calcium cyanamide [trans. title], K. Scharrer (*Chem. Ztg., 49 (1925), Nos. 32, pp. 237, 238; 33, pp. 243, 244*).—The literature on various methods of determining total nitrogen in calcium cyanamide is reviewed, and a new method is described which is said to yield duplicate results in good agreement and to require much less time than the methods in common use. The method is essentially a modification of the Kjeldahl process in which copper powder is used to hasten the oxidation.

Sources of error in the determination of phosphoric acid by the molybdate-magnesia method, J. M. McCandless and J. Q. Burton (*Indus. and Engin. Chem., 16 (1924), No. 12, pp. 1267–1270*).—The chief source of error in the molybdate-magnesia method of determining phosphoric acid when applied to materials such as superphosphates containing between 45 and 50 per cent of phosphoric acid is considered to be the failure to secure the exact degree of neutralization of the solution of the yellow precipitate. The use of delicate litmus paper as indicator for this neutralization is recommended. Data are reported on the amount of magnesium pyrophosphate and corresponding percentages of phosphoric acid obtained from a standard solution of purified potassium phosphate containing quantities of other salts furnishing the amounts of lime, iron, aluminum, and fluorine under the conditions of exact neutralization to litmus, exact neutralization followed by the addition of small quantities of ammonia, and exact neutralization followed by a slight excess of hydrochloric acid. Similar data are also reported for the analysis of standard phosphate rock and Anaconda superphosphate. In all cases the results obtained on exact neutralization before precipitation corresponded closely to the theoretical percentage of phosphoric acid contained in the salt, but when the solution was made slightly alkaline the results were low and when made slightly acid the results were high.

Attention is called to the differences in the color of the precipitate formed after ignition under different conditions of neutralization, and theories are advanced to account for the differences noted. The paper closes with a detailed description of the technique of the method as modified to overcome the sources of error pointed out.

A simple test for determining the oil content of flaxseed, D. A. Coleman and H. C. Fellows (*U. S. Dept. Agr., Bur. Agr. Econ., Grain Invest., [Pub.] 33 (1925), pp. 19, figs. 2*).—This mimeographed publication presents data on the domestic production and importation of flaxseed in the United States from 1911 to 1924, inclusive; outlines present methods of inspecting and grading flaxseed, with data showing that these methods are of doubtful value in indicating the oil content of the samples; and describes the development of a rapid oil test which is said to be as accurate as the ether extraction method.

The new method is an adaptation of the Wesson optical method of determining the oil content of cottonseed meal,[1] which is based on the differences in

[1] Cotton Oil Press, 4 (1920), No. 3, pp. 70–73.

refractive indices of the oil and of the solvent used in the extraction. As in the original method, Halowax oil is used as the solvent, the difference in the refractive indices of the two oils being 0.15476. With the Valentine refractometer and a temperature of 25° C. the dilution of Halowax oil with pure linseed oil lowers the refractive index of the former by 0.001906 for every per cent of linseed oil in the mixture.

The details of the method are given in full, with a table for converting the refractometer readings into percentages of linseed oil and data showing the accuracy of the new method as compared with the Official ether extraction method. Of the 120 samples tested, 48.7 per cent varied less than 0.1 of a per cent from the Official method, 32.8 per cent more than 0.1 and less than 0.19 per cent, and only 4.2 per cent more than 0.3 per cent, the greatest variation being only 0.33 per cent. It is estimated that after the analyst has become thoroughly familiar with the technique, from 10 to 12 tests can be made easily in an hour.

The distribution of insulin in human and other animal tissues, with a description of a micro-method for the estimation of insulin in tissues, S. L. Baker, F. Dickens, and E. C. Dodds (*Brit. Jour. Expt. Path., 5 (1924), No. 6, pp. 327–331, figs. 2*).—The acetone-picrate method of preparing insulin previously described by Dodds and Dickens (E. S. R., 51, p. 609) has been found to be applicable to amounts of tissue as small as 10 gm. By means of this method the insulin content of various organs in the ox, pig, horse, and sheep has been determined, with the following results: Ox pancreas, rabbit unit per gland 750, rabbit unit per kilogram 2,500: ox salivary gland 35 and 710: ox ovary inactive; ox liver 600 and 200; pig pancreas 428 and 4,280; horse pancreas 375 and 1,500; sheep pancreas 100 and 1,000; and cat pancreas 2 and 2,000, respectively.

Data are also reported on the insulin content of various organs of human subjects who had died from different diseases. Of particular interest are the observations that the insulin content of the kidneys and spleen is roughly about the same per kilogram as that of the pancreas, and that the organs of a person dying in diabetic coma contained appreciable amounts of insulin.

On applying the method to vegetable tissues, active material indistinguishable from insulin was obtained from potatoes and onions but not from yeast.

Determination of the hydrogen-ion concentration of cane juices in Natal and Mauritius, R. G. W. Farnell (*Internatl. Sugar Jour., 27 (1925), No. 314, pp. 89, 90*).—This is a general discussion of the use of H-ion concentration determinations in cane sugar refineries, with data on the pH values of the different sugarhouse products in Natal and Mauritius. The average figures for the pH values of the different products are as follows: Raw juice, Natal, 5.4, and Mauritius, 5.8; sulfured 3.6 and 3.8; clarified 6.4 and 6.7; sirup 6.2 and 6.5; and filter press juice 7.6 and 7.9, respectively.

The effect of filtration with vegetable carbons and "Filter-Cel" (Kieselguhr) on the number of micro-organisms in cane juices and on their subsequent rate of development, W. L. Owen (*Internatl. Sugar Jour., 26 (1924), Nos. 304, pp. 200–207; 305, pp. 255–260*).—In this investigation a study was first made of the comparative efficiency of Filter-Cel, Darco, Norit, and Suchar in removing microorganisms from cane juices. This was followed by a study of the comparative rate of growth of microorganisms in unfiltered and carbon-filtered juices and sirups.

The juices were filtered cold through the previously sterilized filtering agents and then plated and incubated for 3 days at 34° C. But little correlation could be noted between the increase in purity of the filtered juices and

the percentage of organisms removed by filtration. The filtration in all cases removed about 99.5 per cent of the microorganisms as compared with about 75 per cent for cotton wool. The filtering action was selective for the gum-forming bacteria, leaving yeasts and molds to predominate in the filtrate. This would seem to furnish an argument for the more general use of such filters in that more trouble is experienced with gum-forming bacteria than with other microorganisms in juice clarification.

In the second part of the investigation the development of microorganisms appeared to be slower for short periods in the filtered than unfiltered juices and the deterioration to follow in the same order, but for periods longer than 24 hours no change was apparent in the filtered juices. In juices with the same initial infection, as much formaldehyde was required for preservation in the filtered as in the unfiltered samples. Sirups made from filtered juices appeared to ferment as readily as those made from unfiltered juices.

The investigation was finally extended to a comparison of the deterioration of juices from souud cane and from cane damaged by frost or overheating. The damaged cane yielded more viscous juices, and the growth of microorganisms in the juices was constant from the beginning, while the growth in the juice from sound cane underwent an initial period of depression.

Colloids in cane and beet sugar manufacture, H. S. Paine, M. S. Badollet, and J. C. Keane (*Indus. and Engin. Chem., 16 (1924), No. 12, pp. 1252–1258, fig. 1*).—This contribution from the carbohydrate laboratory of the Bureau of Chemistry, U. S. D. A., consists of a report on the application of certain colloid investigational methods to the analysis of various sugar beet and sugar cane products with a view to the adoption of methods for preventing or lessening the production of off-color sugar and for controlling viscosity effects resulting in delayed filtration, boiling, and crystallization. The data reported include ultrafiltration, gold number, and surface tension data on granulated sugar and sugar beet molasses; the percentage composition of the colloids of raw cane sugar, granulated sugar, and beet molasses; the araban and galactan contents of the total colloids from beet products; the composition of colloids separated from Steffen molasses; ultramicroscopic cataphoresis measurements on raw cane sugar and beet molasses; the relation between colloid concentration and surface tension; foaming experiments; and supplemental data on comparative tests of sugar and candy for polarization, H-ion concentration, surface tension, and reducing substances calculated as invert sugar.

"As an important deduction from all the foregoing, it is concluded that the mooted question of influence of cane and beet pigments upon the production of off-color granulated sugar resulting from various factory processes may be accurately investigated by separating the pigments and other colloids from typical samples of the sugar produced and then reasoning a posteriori to the initial stages of the factory procedure, instead of depending solely upon a priori reasoning based upon the pigments present in cane and beet juices."

The deterioration of raw sugars in storage, [I], II, W. L. Owen (*Facts About Sugar, 20 (1925), Nos. 8, pp. 178, 179; 13, pp. 300, 301, 307*).—This general discussion of the factors involved in the deterioration of raw sugar in storage is based upon the author's investigations, which have been previously noted (E. S. R., 49, p. 614), and upon other literature on the subject.

A method for the manufacture of levulose, R. F. Jackson, C. G. Silsbee, and M. J. Proffitt (*Indus. and Engin. Chem., 16 (1924), No. 12, pp. 1250, 1251; also in Planter and Sugar Manfr., 73 (1924), No. 24, pp. 469, 470*).—In the method described, the tubers of Jerusalem artichokes were used as a source of levulose.

The juices extracted from the tubers were immediately acidified with sufficient sulfuric acid to supply about one-fifth normality, heated to 70° C. for about 30 minutes, filtered, treated with lime to give a slight alkalinity (pH 7.5 to 8), filtered, precipitated with lime, carbonated in the usual manner, concentrated in vacuo to about 91 per cent solids, crystallized by the temperature drop method, and the massecuite finally spun on a centrifugal machine. The recovery of levulose in crystal form was about 80 to 85 per cent of that in the extracted juice.

An improvement in the method of lime precipitation of the levulose was effected by conducting the precipitation in an 8-qt. ice-cream freezer. The milk of lime was added in small fractions through a hole in the cover, while the sugar solution dripped continuously through a hole drilled in the shaft of the dasher. This resulted in the formation of crystals of levulate of such size that the subsequent filtration was more rapid.

The crystallization experiments were also conducted in an ice cream freezer, the crank of which was replaced by a large motor-driven pulley operating at a speed of one revolution in 2 or 3 minutes. The freezer was placed in an air bath kept under temperature control, the temperature being lowered from 55° to room temperature, 25°, in from 24 to 36 hours.

The field for research in the flour-milling industry, E. A. FISHER (*Sci. Prog.* [*London*], *19* (*1925*), *No. 76, pp. 614–627*).—In this paper by the director of research, Research Association of British Flour-Millers, various types of research problems of value to the milling industry are outlined. These include the improvement of analytical methods, the development of standard specifications for raw products, the discovery and exploitation of new products, engineering problems concerned with manufacturing processes and storage of the products, and systematic search of the literature.

Compilation relating to uses and products made of corn, C. L. PHILLIPS and E. G. BOERNER (*U. S. Dept. Agr., Bur. Agr. Econ., Grain Invest.,* [*Pub.*] *31* (*1925*), *pp.* [*2*]+*21, figs. 2*).—This is a mimeographed compilation from various sources of information on the utilization of corn and its by-products and of cornstalks, leaves, and cobs. A list of literature references is appended.

The principles and practice of sun-drying fruit, A. W. CHRISTIE and L. C. BARNARD (*California Sta. Bul. 388* (*1925*), *pp. 3–60, pl. 1, figs. 21*).—Following a brief discussion of the extent of the dried fruit industry and of the principal localities and varieties of fruit for sun-drying in California, standard methods of sun-drying fruits are given in considerable detail, with descriptions and illustrations of the necessary equipment. Estimated costs are given for picking and drying apricots, peaches, pears, prunes, figs, and raisins. A colored plate is included showing the actual size and color of special grades of sun-dried peaches, prunes, apricots, pears, and figs.

METEOROLOGY

The big tree as a climatic measure, E. ANTEVS (*Carnegie Inst. Wash. Yearbook 22* (*1922–23*), *pp. 299–301*).—Further study of the sequoias indicates that variations in growth are a result of a combination of climatic factors, the chief of which are precipitation, temperature, and sun radiation, and that the variations can not always be clearly correlated with high or low rainfall. Before positive conclusions can be drawn from the tree growth data "regarding the climate of the past and regarding the relationship between variations of growth and fluctuations of lakes and changes of human culture in the Southwest . . ., it is necessary to have data on temperature, better knowl-

edge of the relation between precipitation and growth of sequoia trees in dry situations, and general knowledge of the rôle of the sun radiation for growth."

The big trees as a climatic yard-stick, E. HUNTINGTON (*Carnegie Inst. Wash. Yearbook 22 (1922–23), p. 301*).—The general conclusion drawn from the study very briefly noted in this article is that "the big trees, when studied by the method of correlative coefficients, show that they can properly be used as a climatic yardstick for certain areas in various parts of the world, but not for other intervening areas.

"Another phase of the present study indicates that the rainfall of the second or third year previous to the growth of the trees has the greatest effect on growth. Where trees grow in moist places the rainfall for as long as 10 years has some effect."

Measurements of the [solar] variation, C. G. ABBOT (*Science, 61 (1925), No. 1586, pp. 549, 550*).—This is an abstract of a paper presented at the Washington meeting of the National Academy of Sciences, April 25 and 26, 1925, briefly reviewing the work of the Smithsonian Institution on measuring the solar constant.

Meteorological report for 1923, F. E. HEPNER (*Wyoming Sta. Rpt. 1924, pp. 174–176*).—Observations at the University of Wyoming, Laramie, on pressure, temperature, precipitation, wind, and cloudiness are summarized. The mean pressure for the year was 23.062 in. The maximum temperature was 85° F. July 22, the minimum −29° December 31. The mean monthly temperature was 40°. The last killing frost in spring occurred May 21, the first in autumn October 11. The annual precipitation was 13.42 in., about 3 in. above the normal, "nearly one-half of which, however, came in one storm on the ninth of June."

Studies of the coastal meteorology and climatology of Madagascar [trans. title], BLOSSET (*Madagascar Bul. Écon., 21 (1924), III–IV, No. 3–4, pp. 5–20, pls. 22*).—This article includes a brief history of meteorological observations in Madagascar, the organization of the meteorological service, and sources and value of available data. Monthly means of pressure, temperature, rainfall, and direction and force of winds are shown graphically as indications of the kind of weather the navigator is likely to encounter on different parts of the coast. A study of the data with reference to Angot's and Guilbert's laws is also reported.

A comparison between the Mediterranean climates of Eurasia and the Americas, H. A. MATTHEWS (*Scot. Geogr. Mag., 40 (1924), No. 3, pp. 150–159, fig. 1*).—Certain contrasts as well as similarities between the climate of the Mediterranean area and that of California and Chile are pointed out, and it is stated that in all of these areas there is a broad underlying similarity connected with their closely corresponding exposure to the swing of the wind systems. At the same time considerable differences occur, which "may be logically traced back to the fundamental fact that in Eurasia feature lines are east and west lines, while those of the Americans have a north and south trend."

Climatology of grains in Sicily [trans. title], F. EREDIA (*Atti Soc. Agron. Ital., 4–5 (1924), No. 3, pp. 129–131*).—This is a brief discussion of the general climatic conditions of Sicily, especially as related to grain production.

Recent developments in weather insurance, A. H. PALMER (*Bul. Amer. Met. Soc., 6 (1925), No. 5, pp. 65–73*).—Recent developments in insurance against crop failures due to unfavorable weather conditions are briefly reviewed, and the opinion is expressed that such insurance will grow in volume and importance.

SOILS—FERTILIZERS

Soil survey of Lonoke County, Arkansas, E. W. Knobel et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1279–1327, pls. 2, fig. 1, map 1*).—This survey deals with the soils of an area of 506,880 acres situated slightly east of the geographical center of Arkansas. Topographically the county is divided into (1) sandstone ridges with intervening valleys, (2) a gently rolling coastal plain area, (3) alluvial terraces, and (4) river bottoms.

The soils are all light in color. Thirty-seven soil types of 20 series are mapped, of which the Crowley silt loam and Perry clay cover 18.3 and 17.5 per cent of the area, respectively.

Soil survey of Delaware County, Iowa, C. Lounsbury and B. Boatman (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+32, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 365,440 acres situated in the prairie region in northeastern Iowa. The topography varies from undulating or rolling in the southwestern and central parts to sharply rolling or somewhat broken in the northeastern part. As a whole the regional drainage is well established.

Most of the soils are of dark color and are of glacial and loessial origin. Including peat, 25 soil types of 17 series are mapped, of which the Carrington loam and the Tama, Carrington, and Clinton silt loams cover 22.9, 14.9, 12.4, and 11.9 per cent of the area, respectively.

Soil survey of Greene County, Pennsylvania, S. O. Perkins et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1251–1278, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the Pennsylvania Experiment Station and the Pennsylvania Department of Internal Affairs, deals with the soils of an area of 367,360 acres lying within the Allegheny Plateau in the extreme southwestern corner of Pennsylvania. The topography ranges from nearly flat in the stream bottoms and on the terraces to gently rolling, rolling, and very hilly in the uplands.

The soils of the county are well drained except on a few small terrace and first-bottom areas. The upland soils are residual from noncalcareous shales and sandstones and to some extent from interbedded limestone. The stream terrace and first-bottom soils are of old and recent alluvial origin, respectively. Including rough stony land, 11 soil types of 7 series are mapped, of which the Westmoreland silt loam covers 77.9 per cent of the area.

On the formation of soil from diabase in the central Transvaal, C. R. van der Merwe (*So. African Jour. Sci., 21 (1924), pp. 235–242, pl. 1*).—Studies of three samples of soil of diabase origin are reported, showing that the weathering of the diabase, whether intrusive or contemporaneous and under varying rainfall and climatic conditions, is due mainly to chemical decomposition accompanied by solution and leaching of the more soluble ingredients. Mechanical disintegration plays a very subordinate part in the degeneration of the rock.

The reaction of some Transvaal soils, J. J. Theron (*So. African Jour. Sci., 21 (1924), pp. 223–226*).—In a contribution from the School of Agriculture, Potchefstroom, data on the reactions of certain typical Transvaal soils are briefly reported and discussed.

The reactions of soils overlying the sandstones and grits of the Karroo system have always been found to be in the neighborhood of pH 6.1. The sandy soils overlying rocks of the Waterberg system are more alkaline than those overlying rocks of the Karroo system. Soils overlying the quartzites and shales of the Pretoria series are nearly neutral in all the widely separated localities in which

this soil type occurs. Soils derived from the red granites are slightly acid, while those from the old granites are slightly alkaline. Quartzites of the Witwatersrand series gave rise to the most acid of the soils studied, and are considered to be probably the only soils that are sufficiently acid to need correction. Cultivation so far has not changed the reaction of these soils, and the relatively small differences of climate apparently have no influence on reaction.

Contributions to the question concerning the methods of estimating the adsorption capacity and the condition of unsaturation of soils [trans. title], E. V. Bobko and D. L. Askinazi (*Trudy Nauch. Inst. Udobr.* (*Trans. Inst. Fert.* [*Moscow*]), *No. 25* (*1925*), *pp. 42*).—Studies of the estimation of the adsorptive capacity of soils are reported, showing that the requirements for the proper exchange of bases are met by the use of barium chloride. It was found that if the same sample of soil was treated alternately with barium chloride and 0.05 N hydrochloric acid the adsorptive capacity of the soil remained fairly uniform in the case of soils with a small adsorptive capacity, such as podsol, and that it decreased rapidly at first and then more slowly in soils with a high adsorptive capacity, such as chernozem. It is tentatively concluded that the decrease in adsorptive capacity may be accounted for only by the destruction of the soil complex.

In studies of the unsaturated condition of soils, it was found that when soils were treated with barium chloride the H ion present can be replaced as well as the other bases, but not so easily. In some soils, such as podsol, the unsaturated condition was found to constitute 48.5 per cent of the total adsorptive capacity. A fairly equivalent proportion was found to exist between the quantities of barium and H ions adsorbed by the soil in the process of the removal of barium by a 0.05 N hydrochloric acid solution. These results are considered to confirm those of Hissink (E. S. R., 45, p. 323) and Gedroits that the unsaturated condition is a result of a substitution of the H ions for a part of the bases of the adsorbing complex.

Adsorption of dyes by soils, J. A. Wilkinson and W. Hoff (*Jour. Phys. Chem.*, *29* (*1925*), *No. 7*, *pp. 808–815*, *figs. 4*).—Studies conducted at the Iowa State College are reported which showed that the adsorption of dyes by soils and clays is of the same nature as the dyeing of fibers. The amount of dye taken up may be increased or decreased by varying the acidity or alkalinity of the solution. Ninety-five per cent of the total dye adsorbed will be taken up during an hour of steady shaking. Some evidence was obtained of base exchange between the dyes and the basic elements of the soil.

Effect of cropping upon the active potash of the soil, G. S. Fraps (*Texas Sta. Bul. 325* (*1924*), *pp. 3–18*, *fig. 1*).—Studies on the effect of cropping upon the active potash of Texas soils showed that the active potash, which is that dissolved by N/5 nitric acid, is decreased when crops are grown upon the soil. The amount of active potash lost from soil in 409 pot experiments averaged 40.9 per cent of the potash removed by the crops. Since successive extractions of the soil removed active potash and the soil also had a fixing power for potash, it is considered that the active potash lost by cropping must be less than that removed by cropping. The correlation factor between the potash removed by the crops and the active potash lost from the soil was found to be 0.722 ± 0.016.

A preliminary note to the study of fixation of ammonia in south Indian soils, T. S. Ramasubramanian (*Agr. Jour. India*, *19* (*1924*), *No. 6*, *pp. 579–589*).—Studies are reported which showed that the soils of the Central Farm, Coimbatore, especially the paddy, garden, and black soils, have a high absorptive power, the process of which is almost instantaneous. The absolute amounts

of ammonia fixed by these soils increased with an increase in concentration of the ammoniacal solution used, while the percentage fixed on the added amount decreased and tended to reach a limit. The fixation of ammonia was accompanied by a displacement of other cations from the soils. Chlorine and carbon dioxide were not affected.

The ammonia equivalents of calcium, magnesium, and potassium found in solution after treatment with the soil did not agree with the ammonia fixed by the soil, but the difference so observed always equaled the ammonia equivalent of the balance of sulfate found in solution after combining with calcium, magnesium, and potassium. Potassium was displaced in the soil when a higher concentration of ammonium sulfate solution was used.

The abnormal behavior of estate soil when compared with other soils in holding back large amounts of acid radicals appeared to be connected with the large amounts of iron and alumina and low amounts of lime present in the soil.

√ **Some factors affecting nitrogen changes in black cotton soil.—II, The influence of moisture content during the rainy season on the ammonifying and nitrifying power of black cotton soil,** F. J. Plymen and D. V. Bal (*Agr. Jour. India, 20 (1925), No. 1, pp. 8–15, figs. 2*).—In a second contribution to the subject (E. S. R., 41, p. 816) studies are reported on the effect of the rainfall during the monsoon upon the oxidized nitrogen of black cotton soil, and a relation is shown between the moisture content of the soil and its nitrifying power.

A moisture content of from 24 to 30 per cent appeared to enable this soil to attain its maximum nitrifying activity. At the temperature prevailing during the monsoon months from 50 to 60 per cent of the added organic nitrogen was oxidized in two weeks.

Nitrification in artificially watered soils previously air dried was slower in starting than with soils receiving natural rainfall, but the nitrifying efficiency after a period of eight weeks was about the same. A heavy clay soil which had lost its texture showed at first a diminished nitrifying power when compared with the same soil in good condition.

Some protozoa found in certain South African soils, III, IV, H. B. Fantham and N. F. Paterson (*So. African Jour. Sci., 20 (1923), No. 2, pp. 437–492; 21 (1924), pp. 445–479*).—The third and fourth contributions to the subject from the University of Witwatersrand, Johannesburg, are presented (E. S. R., 50, p. 518).

In the third paper an account is given of further examinations by direct observation and by water culture of the protozoan fauna of a number of South African soils, each province of the Union being represented. Cultivated, uncultivated, and virgin soils were examined, their protozoa determined, and comparisons made of the protozoa found under different conditions.

Much variation was observed in the protozoan fauna of soils from different localities, the variation being most marked in the kinds of Infusoria found. Apparently most protozoa found in the soils have a relatively wide distribution. In the soils investigated, warmer and moister conditions promoted protozoan activities, while cold retarded them. A similar seasonal variation occurred in water-logged soils.

Either too much acid or too much alkali in soil was found to be detrimental to the protozoan fauna, H-ion concentrations between pH 7.8 and 7.4 and between 6.4 and 6.8 being favorable. Acid soils generally appeared to be richer in protozoa than alkaline soils. Protozoa were found to persist in samples of subsoils taken at depths of from 1 to 2 ft., thus extending the vertical range of protozoa in South African soils.

By comparing all available data, it was found that in soils where a relatively large number of species of protozoa occurred, the cultivated soils tended to have slightly fewer species of protozoa than the corresponding uncultivated soils. However, where relatively few species were found, the reverse was true. Storage of soil did not entirely destroy the protozoan life, but resulted in a disturbance of the sequence of dominant types.

In the fourth paper, the protozoa obtained from some soils from the Cape Province, Orange Free State, Basutoland, and the Transvaal are reported upon, and the results of examinations of various water-logged soils from the Transvaal are presented. The soils examined are grouped into three geographic belts or zones. The coastal belt including Cape Province, Natal, and Portuguese East African soils, the Karroo belt including soils from the Orange Free State, Basutoland, Kimberley, and Grootfontein, C. P., and the high veld belt including all the Transvaal soils except those from Tzaneen. Seventy-two species of protozoa were recorded, of which 34 were common to all three belts, 15 occurred only in the coastal belt, and 6 only in the high veld soils. No species peculiar to the region were observed in the Karroo belt. Four species were common to soils from the Karroo and coastal belts, 1 species to the Karroo and high veld belts, and 11 species occurred in both the coastal and high veld belts.

The protozoan fauna of the Karroo soils seemed to be the least variable in composition. In regard to ordinary soils, moist and warm conditions appeared more favorable to protozoan development than cold, dry ones, and temperature plays a part in their development in water-logged soils. Some protozoa have been found to survive in South African soils under storage for 3 years. In certain cases ciliates, which ordinarily are very late in appearance in water cultures, appeared much earlier in cultures of the stored soil, apparently having responded more quickly to the stimulus of moisture after a long period of dryness due to storage of the soils.

Biological investigation of peat, A. Itano (*Jour. Bact., 10 (1925), No. 1, pp. 87–95, figs. 3*).—In a contribution from the Massachusetts Experiment Station some general statistical material is presented, together with the results of certain biological studies of peat. The latter are taken to indicate the possibility of rendering peat available as a nitrogenous fertilizer when its H-ion concentration has been corrected and certain accessory nutrients have been added to stimulate the growth and activity of the microorganisms already present.

Report of a fertilizer survey in the mulberry districts of Kwangtung, E. Shim (*Lingnaam Agr. Rev., 2 (1925), No. 2, pp. 74–89*).—A description is given of the different fertilizers, both natural and commercial, used in the fertilization of mulberries in China. Notable among these fertilizers are night soil, peanut cake, animal manures, and pond and canal muds.

The availability of nitrogen in nitrate of soda, ammonium sulfate, and dried blood when the amounts of phosphoric acid and potash are varied, A. W. Blair and A. L. Prince (*Soil Sci., 19 (1925), No. 6, pp. 467–476*).—Studies begun in 1922 at the New Jersey Experiment Stations (E. S. R., 51, p. 326) on the availability of three nitrogenous materials separately and in combination in the presence of varying amounts of phosphoric acid and potash are reported.

With rape, doubling and tripling the standard amount of phosphoric acid with a constant supply of nitrogen gave increased yields in some cases and decreased yields in others. On the average the larger amounts of phosphoric acid did not materially change the yields. Supplying a double portion of potash to the rape depressed the yields of dry matter in nearly all cases.

The percentage of nitrogen in the dry matter was not influenced by the amount of phosphoric acid used. With the double portion of potash the average percentage of nitrogen in the dry matter was slightly higher than with the single portion. The percentage of nitrogen recovered in the rape crop was slightly depressed by the larger amounts of phosphoric acid, while the double portion of potash had no appreciable effect on nitrogen recovery. For the combined crops of rape and buckwheat a double portion of potash caused a slight depression in nitrogen recovery. This tendency was also noted with the larger portions of phosphoric acid.

The average results for three years from five crops showed a slight increase in nitrogen recovery with an increase in the amount of phosphoric acid applied. For the same period, the double portion of potash resulted in only slight changes in nitrogen recovery.

Sodium nitrate gave the largest yields and the highest nitrogen recovery for rape, while dried blood gave the lowest. For the residual crop, buckwheat, the dried blood gave the largest yield and the highest nitrogen recovery, but none the less the total results from dried blood fell below those from sodium nitrate both in crop yield and nitrogen recovery. For the combined crops, the ammonium sulfate stood between the sodinm nitrate and the dried blood. The yields of dry matter and the nitrogen recovery were higher when the nitrogen was taken from sodium nitrate alone than when taken from a combination of the three materials.

Experiments on the origin of phosphate deposits, W. A. P. GRAHAM (*Econ. Geol., 20 (1925), No. 4, pp. 319-334, fig. 1*).—Studies conducted at the University of Minnesota are reported which showed that humic acids are probably the best natural solvents of phosphorus, although other solutions have sufficient solvent action to form phosphate deposits. Carbon dioxide solutions dissolve phosphorus and calcium in a ratio of approximately 1 part of phosphoric acid to 100 parts of lime. It is not necessary to have solutions of carbon dioxide or humic acid to dissolve phosphorus to form either residual deposits or deposits from solutions. Even pure water will dissolve some phosphorus and lime.

Solutions free from carbon dioxide leach a larger proportion of phosphorus than lime from a lean phosphate rock, while they leach a larger proportion of lime than phosphorus from a rich phosphate rock. In cases of enrichment of lean phosphate rock residual deposits are to be expected when carbon dioxide solutions are active. Deposits enriched by solution and redeposition are to be expected when organic acids are active.

Preparation and mechanical treatment of phosphates [trans. title], I. M. VERKHOVSKIĬ (E. WERCHOWSKY) (*Trudy Nauch. Inst. Udobr. (Trans. Inst. Fert. [Moscow]), No. 22 (1924), pp. 82, figs. 16*).—A summary of investigations to determine efficient methods in the treatment and preparation of raw phosphates from several typical mines in central Russia, preliminary to chemical treatment, is presented. Preliminary investigations showed that roasting of the lode matter makes it easier to break and changes its color, while the phosphate does not change in hardness and becomes only slightly darker. Concentration tests showed that jigging gives satisfactory results. A process of complete treatment of this phosphate for use as a fertilizer is outlined.

Residual effects of acid phosphate and rock phosphate, W. G. BAKER (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 172–186, figs. 7*).—In a contribution from the Iowa Experiment Station the results of studies by the author and others are summarized, including both greenhouse and field tests covering from two to eight years to determine the residual effects of acid and rock

The residual effects of both phosphates continued to be manifested at the close of the various experiments. Although there were variations in the increases secured, no decreases were noted except in the second clover crop in some of the greenhouse tests. The increases in yields from the acid phosphate were usually higher the first year than in later year. In some cases a high grade acid phosphate gave better results on the second crop. The increases from rock phosphate were less the first year or two and then continued about the same during the remainder of the experiments.

Rich soils showed more and quicker response from phosphate applications than poor soils. As observed in the crop yields showing after effects, clover possessed a higher power to utilize the phosphates than corn or small grains. The after effects of acid and rock phosphates hastened the early growth and maturity and improved the quality of general crops.

Phosphorus from a high-grade acid phosphate was more slowly available the first year or two when the application was made to clays than to silt loams or loams. Larger residual effects were secured from acid phosphate on soil containing lime naturally or by applications of limestone than on acid soils.

Profits from phosphates, A. R. WHITSON and G. RICHARDS (*Wisconsin Sta. Bul. 376 (1925), pp. 22, figs. 12*).—Practical information obtained from fertilizer experiments on the value of phosphates on Wisconsin soils is presented and discussed. It is stated that more than half the soils of Wisconsin would be benefited by phosphatic fertilization, and attention is drawn to the profitable crop increases which have been obtained from moderate applications of phosphate fertilizer.

Lime and magnesia, N. V. S. KNIBBS (*London: Ernest Benn, Ltd., 1924, pp. 306, pls. 20, figs. 30*).—This book deals with the chemistry, manufacture, and use of the oxides, hydroxides, and carbonates of calcium and magnesium. Among a number of others, it contains a chapter on the uses of lime in agriculture.

Limestone resources of Illinois, F. KREY and J. E. LAMAR (*Ill. State Geol. Survey Bul. 46 (1925), pp. 392, figs. 70*).—This report deals with the distribution and general properties of limestone materials in Illinois and the kinds of tests made to determine their suitability for road material.

The determination of lime requirements, E. M. CROWTHER (*Agr. Prog. [Agr. Ed. Assoc., London], 2 (1925), pp. 72–76*).—In a contribution from the Rothamsted Experimental Station data on methods for the determination of the lime requirements of soils are briefly presented and discussed.

The injurious effect of excessive liming on podsol soils in connection with the peculiar character of the biological processes taking place in such soils [trans. title], A. F. TIULIN (*Trudy Nauch. Inst. Udobr. (Trans. Inst. Fert. [Moscow], No. 26 (1925), pp. 43, figs. 6*).—Studies conducted with light, medium, and heavy loam soils to determine the causes of the injurious effect of excessive liming are reported.

An application of 1 per cent of calcium carbonate had an injurious effect only on a light sandy loam soil. The biological processes were more active in a light soil with 1 per cent of lime than in a heavy soil, there being a considerable accumulation of ammonia and nitrates during the first two or three weeks, while in other soils, where no injurious effects were evident, liming did not bring about any marked increase in these materials. A highly alkaline reaction was noticed not only in a light soil receiving 1 per cent of lime where ill effects were noticed, but also in a medium loam soil with the same amount of lime where no injurious effect was produced. This is taken to indicate that a given amount of alkali does not in itself cause injury.

The growth of plants was retarded by increasing the concentration of ammonia in the presence of 1 per cent of lime, indicating that the presence of ammonia is of considerable importance with a given amount of alkali. When the reaction was neutral or slightly acid, ammonium salts alone did not injure the growth of plants but increased the yield.

Washing of soils in which plants were injured during the second or third week after the application of lime improved plant growth. The addition of the bicarbonates of potassium and sodium to 1 per cent of lime eliminated the injurious effect when the total amount of these salts did not exceed 0.05 per cent. Small quantities of lime, not exceeding 0.2 per cent, did not decrease crop yields on light soil in which plants were injured by 1 per cent of lime. The products of biological processes, especially ammonia, were much smaller in amount in this case than in soils excessively limed. Different kinds of plants did not exhibit the same degree of sensitiveness to the injurious effects of excessive liming. In addition this sensitiveness was dependent upon the age of the plant, being very great in the early stages of its growth and becoming less pronounced during the more advanced periods.

Biochemical effects of gypsum on Iowa soils, W. B. Bollen (*Soil Sci., 19 (1925), No. 6, pp. 417–440*).—Studies conducted at Iowa State College are reported which included (1) laboratory and greenhouse experiments with different crops and a single soil type to determine whether or not any correlation exists between crop response and chemical and biological changes induced in the soil by gypsum, and (2) field experiments on various soil types in different sections of Iowa to determine the effects of gypsum on crop growth and composition under actual farming conditions.

The laboratory experiments showed that gypsum had practically no effect on the numbers of soil microorganisms developing on agar plates or on nitrification, sulfur oxidation, and lime requirement of the soil. Sulfur increased markedly the sulfur oxidizing power of the soil. Crop growth, particularly in the case of alfalfa, was materially increased by gypsum and sulfur, the largest application of the former being more effective than the smaller ones. Sulfur in a quantity equivalent to the largest application of gypsum gave essentially the same results as gypsum. Under the conditions of this experiment, gypsum acted largely as a direct sulfur fertilizer.

The field experiments for one season showed that gypsum materially increased the growth of alfalfa on various soil types under different conditions, old well established stands of alfalfa being benefited as well as new seedings. Gypsum apparently imparted an appreciable drought-resisting capacity to alfalfa or to the soil on which it was grown. It also increased the percentage of nitrogen in alfalfa hay in some instances. The smaller applications of gypsum increased the yield of oats grain, while the larger applications increased the yield of straw rather than grain.

Pot and field experiments with common salt, 1920–1921, R. M. Barnette (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 125–129*).—Studies conducted at the New Jersey Experiment Stations are reported from which it is concluded that though under certain conditions common salt may be a proper amendment to certain fertilizers, the cost and time necessary for its application will offset any small increases to be expected.

Analyses of fertilizers, fall season, 1924 (*N. C. Dept. Agr. Bul., 1925, Feb., Sup., pp. 14*).—Guaranties and actual analyses of 288 samples of fertilizers and fertilizer materials collected for inspection in North Carolina during the fall season of 1924 are presented.

Analyses of fertilizers, spring season, 1925, W. G. Haywood (*N. C. Dept. Agr. Bul., 1925, Apr. (Fert. Sup. 1), pp. 12*).—Guaranties and actual analyses

of 193 samples of fertilizers and fertilizer materials collected for inspection in North Carolina during the spring season of 1925 are presented.

AGRICULTURAL BOTANY

Plant physiology, W. BENECKE and L. JOST (*Pflanzenphysiologie. Jena: Gustav Fischer, 4. ed., rev., 1924, vol. 1, pp. VIII+441, pl. 1, figs. 55; 1923, vol. 2, pp. VIII+477, pl. 1, figs. 156*).—This fourth elaborated edition of the work previously noted (E. S. R., 32, p. 520) is in two volumes, the first, on metabolism, being a revision by Benecke of corresponding portions of the former work, and the second, on development and movement, being, in the new form, revised principally by Jost.

Biological studies on creeping plants [trans. title], G.-L. FUNKE (*Compt. Rend. Acad. Sci. [Paris], 176 (1923), No. 9, pp. 604–606*).—Studies on specimens of *Potentilla reptans, P. anserina, Glechoma hederacea, Lysimachia nummularia, Hieracium pilosella, Fragaria vesca,* and *Ajuga reptans,* as outlined, show clearly a remarkable capability for adaptation, even in adult portions of the plant.

Growth and heliotropism [trans. title], H. RICÔME (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 2, pp. 135, 136*).—The direction taken by a young bean plantlet in growing is said to have been a resultant of the two influences, gravity and illumination, and to have varied with the intensity of the latter, even when the direction of its incidence was constant.

The effect of high temperatures on the germination and subsequent growth of corn, R. KIENHOLZ (*Philippine Jour. Sci., 25 (1924), No. 3, pp. 311–347, pl. 1, figs. 4*).—In an elaborate study of the effects of high temperatures on seed corn, it was found that air-dry corn (containing from 10 to 11 per cent of moisture) was killed by exposure to 80° C. for 25 minutes and to 90° for 10 minutes and injured by exposure to 70, 80, and 90° for 80, 10, and 5 minutes, respectively. Resistance to heat varied inversely as water content. Air-dry diseased corn contained the most moisture, disease-free corn the least, and badly diseased an intermediate amount. After desiccation over sulfuric acid diseased corn contained the least moisture, disease-free corn the most, and badly diseased an intermediate percentage. After desiccation diseased corn was much more resistant to heat, as compared with disease-free or badly diseased corn, than its slightly less moisture percentage would indicate, this greater resistance becoming evident, however, only as the temperatures become injurious. The nature of these changes is not apparent.

Desiccation over sulfuric acid is said to be greatest at points farthest removed from the acid, and to be least at points closest to its surface. This gradient gradually decreases as the period of desiccation lengthens.

Resistance of air-dry corn to heat, both in the laboratory and in air out of doors, is a function of humidity, the three kinds of corn tested varying similarly. Viability is not affected by placing the corn in water immediately after it is heated. Rag-doll tested corn germinated better than did soil-germinated seed. General correspondence is shown between germination percentage and growth of seedlings in the case of both treated and untreated seed.

Germination percentages, green weight, and height of plants of heated corn grown in soil parallel the behavior shown in germination in rag dolls. In air-dry corn the disease-free is consistently highest, diseased lowest, and badly diseased intermediate. In desiccated corn the diseased is consistently highest, disease-free usually lowest, and badly diseased variable between lowest and intermediate.

65195—25——3

Reversible variations in volume, pressure, and movements of sap in trees, D. T. MacDougal (*Carnegie Inst. Wash. Pub. 365 (1925), pp. III+90, pls. 5, figs. 13*).—The daily reversible variations in tree trunk diameter have been studied in the Monterey pine (*Pinus radiata*). It is said that the relevant results all support Dixon's conception of the cohesive column of water as the main feature of the hydrostatics and movement of liquids in trees.

Electrolytes enter the plant through the living parts of the root at a rate and in a proportion determined by their own ionic mobilities, and as modified by their interaction with the colloidal materials in the endodermal membrane (all the layers of living cells between epidermis and xylem). Water is pulled through the same layer by osmotic action. Some organic matter from maturing cells passes into the xylem, with the result that the upwardly moving stream carries both salts and organic compounds. Perforations in the wood pit membranes may afford continuous passage for all particles carried.

When the stump made by excising the terminal of a small tree was connected with an air pump a noticeable increase in the conduction of liquids resulted. Basally applied pressures also resulted in accelerations. The living ray cells are considered as capable of exerting exudation pressure. A new method has been developed for the measurement of exudation pressures in trunks, and the Monterey pine is well adapted to such testing, some results of which are presented. Among the methods employed of related experimentation girdling of trunks, topping, and defoliation are important in connection with several major processes in the tree.

Defoliation of the pine without breaking the water column in the trunk has been carried out on trees at various seasons. The younger leaves appear to be the more indispensable. Defoliation results in a lessened carbohydrate content of the stem. Scars from leaf removal quickly seal with resinous material, so that the water column remains intact, and the trunk swells thereafter for two or three days. The subsequent daily reversible variations are minimized. The colloidal remains of the evaporating cells in the dead leaves and terminals would furnish evaporating menisci, the action of which would sustain a cohesive column of water. It seems clear that such variations persist in trees which are dead throughout. Such trees show a diminished water content of the trunk and little sugar in the wood cells. No exudation pressures are possible under such conditions, but a manometer connected with a hole bored into the trunk shows slight negative pressures, due to the absorption of water from the tubes of the instrument.

The dynamics of water movement in vascular plants [trans. title], H. R. Bode (*Jahrb. Wiss. Bot., 62 (1923), No. 1, pp. 92–127, figs. 6*).—Direct microscopic observations made on rooted shoots prove that the continuity of the vascular water columns persists in spite of the tension existing in all vessels of a wilted plant, even under conditions unfavorable to water absorption. This condition of continuity is not changed in full sunlight when the shade (air) temperature is 34° C. (93.2° F.). The existence of a cohesion tension is demonstrated by wounding the vessels under quicksilver, when the mercury itself establishes a direct continuity with the water columns. This is held to demonstrate the impossibility, from a physical point of view, of the gas which is or may be dissolved in the vascular water becoming separated in the form of bubbles in the conducting vessels. Such bubbles, when appearing in the work of earlier authors, simply evidence, it is claimed, the use of inappropriate methods for this work.

The diameter of an individual vessel of an herbaceous plant shows, under severe transpiration conditions with insufficient accessibility of water supply,

a measurable decrease, which is to be explained only by cohesion tension in the still intact water columns. In both shoot and root filtration resistance shows complete proportionality to the pressure difference. In case of *Helianthus annuus*, at temperatures from 14 to 30° C., a continual decrease of root resistance was noted. However, between 10 and 14° the resistance showed an abrupt diminution, which is thought to have its cause in the activity of the living root cells.

Tree trunks, growth and reversible variations in circumference, D. T. MacDougal (*Science, 61 (1925), No. 1579, pp. 370–372*).—Having in view the production of cellulose by trees during growth in size, the author has used the dendrograph during several seasons, making records of the growth performance of trees in about a dozen genera. Attention has been concentrated chiefly on the Monterey pine (*Pinus radiata*) and the coast redwood (*Sequoia sempervirens*). An accumulation has been accomplished of continuous records (obtained by taking trees representing different developmental stages) for a total of more than a century, about half of which is for the Monterey pine, with about 15 seasons of redwood records.

The only generalization attempted as to growth from the dendographic records of the Monterey pine is that the thickness of the wood layer formed in any year is closely correlated with the length of the growing season, which is stated to involve a complex of agencies. Growth entails a condensation, by dehydration, of material to proteins and to carbohydrates in every cell preliminary to distention, and any curve fitted to this procedure will necessarily be wide of many available facts.

Trunk increments and decrements not fixed by morphological change have been since 1921 (E. S. R., 45, p. 645) termed "reversible variations," these variations depending on expansions and contractions of tracheids and vessels following altered tensions of the cohesive water column present, and to a minor extent upon the state of hydration of the phloem and cortex. That these variations are not primarily an index of the balance between absorption and transpiration is shown by the fact that a contraction of the basal part of a giant redwood 150 ft. in height occurs within 15 minutes after the rays of the rising sun strike the summit of the crown. Bode has also shown in the article noted above that similar changes follow altered cohesion tensions in small plants. Similar reversals of these alterations have been recorded in the Monterey pine, by which increase in diameter takes place during daylight—the usual program of tree cactuses. It is notable that large roots near the base of the trunk of a pine show reversible variations of opposite phase to those in the trunk.

A pine tree dying from defoliation in midsummer still transpires at a lessened rate, which is, however, sufficient to maintain a cohesive column of upwardly moving water in which daily variations in tension are measurable. It is considered as highly probable that ascent of sap and reversible variations continue for a time in trees in which every cell is dead. The colloidal masses of dead cells at the terminals are the seat of a minimized transpiration of amount sufficient to maintain tension on the water column in wood cells which are dead when they become conductors. The conditions described may be taken to illustrate the ascent of sap in trees without the participation of living cells.

Biological control of the influence of fertilizers; determination of the susceptible period [trans. title], L. Blaringhem (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 6, pp. 407–409*).—The results as tabulated of tests with fertilizers on barley, flax, and poppy show, first, the need of choosing obvious

characters (as the stigmatic number in poppy) in testing the comparative effects of fertilizers, and second, the necessity of resolving their growth-phase reactions to fertilizers into periods, such as rosette, flowering, and maturation. The required maximum of precision can not be obtained without employing pure-line plants.

The reaction of the cotton plant, J. A. Harris, W. F. Hoffman, and A. H. Johnson (*Science, 61 (1925), No. 1568, p. 65*).—As a result of hundreds of determinations of the H-ion concentration of mature cotton leaves, the authors found the H-ion concentration well on the acid side of neutrality. The average values for the series of Pima Egyptian cotton grown in 1921 range from pH 5.25 to 5.41, whereas for the series of upland cotton grown under similar conditions they range from pH 5.35 to 5.46, as shown elsewhere (E. S. R., 51, p. 331). The H-ion concentration of the tissue fluids of the F_1 hybrid is intermediate between that of the Egyptian and upland types, being on the average lower than the Egyptian and higher than the upland parent.

The only tissue fluids which have been found that have a neutral or significantly alkaline reaction were in Mentzelia of the Loasaceae and various representatives of the Cucurbitaceae.

Variation and fluctuation in the number of stigmata in Papaver [trans. title], P. Vuillemin (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 8, pp. 444, 445*).—The author, referring to the above statements by Blaringhem and to his own previous work with Papaver,[2] gives data regarding the stigmatic number as affected by fertilizers, asserting that experimenters should take into consideration the extent of variation normally produced by such changes, and that for experimentation in the biological control of the influence of fertilizers the experimenter should choose characters which are less modified by normal variation than by fluctuation.

[The adaptive relation of seed anomalies in Lepidium sativum to saltness], P. Lesage (*Rev. Gén. Bot., 35 (1923), No. 413, pp. 209–212*).—Since 1911, the author has carried on the work of studying, in pots under glass, *L. sativum* supplied with aqueous salt solution of strengths 1.0, 1.2, and 1.4 per cent in comparison with like plants grown as controls in spring water. Some of the results of this work appear below, and some have been noted previously (E. S. R., 50, p. 428).

Plants grown under the condition of saltness have smaller size and fewer large seeds, and they show less seed weight and length than do the controls grown in spring water. The characters arising in connection with salt-water culture show a certain persistence in the descendants grown in fresh water. Abnormal seeds are met with more frequently in salt-grown plants and in their descendants, particularly when these are grown in salt water. The plants acquire a certain resistance to saltness.

Seed anomalies of Capsella bursa-pastoris caused by saltness [trans. title], P. Lesage (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 6, pp. 406, 407*).—The results of work, as reported in the accounts noted above, have eventuated in the statements above noted regarding the influence of sodium chloride on the development, in his cultures of *Lepidium sativum*, of characters which appear to be hereditary.

During 1923 the author tested this possibility with other crucifers, particularly with *C. bursa-pastoris*, from which Blaringhem (E. S. R., 26, p. 227) is said to have derived plants showing in a very large majority of their progeny plants having four valves. Though the copious results claimed to have been obtained by Blaringhem from plants grown in highly salted soil were not

[2] Bul. Soc. Bot. France, 54 (1907), No. 7, pp. 511–517.

realized, anomalous fruits are reported, and the possible significance of this fact is suggested.

Variation in perfumes due to grafting [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 15, pp. 999-1001*).—During some years the author studied the matter of grafting as related to plant qualities, and he has noted in particular here the production and modification by such means of substances, chiefly odoriferous, of interest in commerce or medicine. Grafting is said to result in most instances in the production of substances of greater or lesser value than those originally given by the graft components.

Anthocyanins and carotins.—I, Parallelism in the occurrence of anthocyanin and carotin in vegetative plant organs [trans. title], T. LIPPMAA (*Sitzber. Naturf. Gesell. Univ. Dorpat, 30* (*1923*), *No. 3-4, pp. 58-111*).—After an account of the parallelisms, it is pointed out that anthocyanins and carotins may have different functions in different plant organs. An extensive bibliography is furnished.

Heterothallism in Ophiobolus cariceti, R. S. KIRBY (*Abs. in Phytopathology, 13* (*1923*), *No. 1, p. 35*).—Monosporous cultures of *O. cariceti* show two distinct sexual types which when mixed in culture result in the formation of typical perithecia. These develop in 4 months in 2 per cent crushed wheat in agar or on stems of wheat or *Melilotus alba.* On agars of potato, wheat, corn meal, or oatmeal a definite dark zone is produced where colonies of different sexual type meet, such zone being absent where colonies of like sexual type meet. Monosporous cultures retained their types during hundreds of tests extending through 20 months. Polysporous cultures during this period segregated into sexual types capable of reacting with each other or with monosporous cultures of the opposite sex type. Each of the 175 isolations of monosporous or polysporous origin has exhibited a definite sex type.

GENETICS

Living organisms, E. S. GOODRICH (*Oxford, Eng.: Clarendon Press, 1924, pp. 200, pl. 1, figs. 60*).—This book deals with organic evolution and heredity, containing chapters on the nature and origin of life; the cellular structure of organisms, reproduction, and death; Darwinism and heredity; variation and the factors of inheritance, determination of sex; the struggle for existence and natural selection; isolation and sexual selection; phylogeny and classification; the geological record of success and failure; and psychology and the evolution of intelligence.

Chromosomes, endocrines, and heredity, C. B. DAVENPORT (*Sci. Mo., 20* (*1925*), *No. 5, pp. 491-498, figs. 5*).—A discussion of the complicated interactions between chromosomes, hormones, other developmental impulses, and environmental conditions in determining the final characteristics of living organisms.

Litter size, birth weight, and early growth rate of mice (Mus musculus), W. H. GATES (*Anat. Rec., 29* (*1925*), *No. 3, pp. 183-193, figs. 4*).—This is a statistical study, based on data collected by C. C. Little at the Carnegie Institution, Cold Spring Harbor, from 106 litters of mice born during the summer of 1922. Only individuals born alive are considered. The mice consisted of 324 males and 328 females, making the sex ratio approximately equal. The mortality was shown to be high during the first two days, with a slight decrease followed by a gradual increase to the seventeenth day and a sudden drop to weaning.

Each individual was weighed on alternate days from birth to weaning at 21 days of age. No difference was evident between the birth weights of males

and females, but the females were slightly heavier and made somewhat greater gains from the third to the nineteenth day, after which the males tended to overtake them. The size of litter had a distinct influence on not only the birth weights but also weights at weaning, litters of two averaging the heaviest, with a gradual decrease to litters of nine, beyond which the birth weight was practically stationary. No difference in the mortality was evident in litters of different sizes.

The genetics of the potato [trans title], C. FRUWIRTH (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1925, vol. 1, pp. 315–362*).—The results of genetic investigations with the potato in Europe and America are summarized under the topics of flowering and fruiting, inbreeding, hybridization, spontaneous variability, grafting, degeneration, and selection, together with a bibliography of 181 titles.

On the relative value of certain methods of potato breeding, F. A. KRANTZ (*Potato Assoc. Amer. Proc., 11 (1924), pp. 40–44*).—The methods used during the last 30 years in the improvement of the potato are surveyed critically to determine their relative value to the plant breeder.

American varieties of potatoes owe their origin primarily to sexual breeding. Improvement methods based on somatic or vegetative variations have been of doubtful value as far as permanent hereditary improvement is concerned. Immediate improvement by sexual breeding is limited at present because of the paucity of varieties dependable as pollen parents and their inferior nature in regard to commercial characters. Production of better parental material is necessary as a basis for future potato breeding work. Methods of breeding depending on the nature of the material seem to promise most in the production of this breeding stock.

Selection of sweet potatoes, E. A. STOKDYK (*Jour. Heredity, 16 (1925), No. 4, pp. 147–150, figs. 2*).—Sweet potatoes from New Jersey transmitted their short blocky type to the first and second propagations in Kansas, but in subsequent years the blocky character disappeared and the roots were of the stringy Kansas type. Seed hills selected for blocky type during four years did not produce roots differing in type from unselected stock.

[Cumulative factors in the inheritance of flower spotting] A. BROŽEK (*Preslia (Bul. Soc. Bot. Tchécoslov. Prague), No. 2 (1922), pp. 13–25, figs. 7*).—From this account of crossings made between *Mimulus quinquevulnerus rubinus* and *M. tigrinus luteus*, it appears that the variability of the F_1 plants is large, that of the F_2 plants larger. It is supposed that the large variability in F_2 is genetically caused by two or there pairs of cumulative factors. The back crossings of the F_1 with pure *rubinus* or with pure *luteus* gave progeny showing variability approaching more nearly to the *rubinus* type or else to the *luteus* type.

Varietal formation in man [trans. title], A. C. HAGEDOORN (*Genetica [The Hague], 6 (1924), No. 5, pp. 401–463, figs. 3*).—The author has discussed the causes of variability among living organisms, and concludes that aside from variations due to environmental influences variability results from recombinations of factors brought about by crossing organisms genetically different rather than by the loss or modification of factors already present (mutations). Various new terms are suggested for qualitatively designating variability. The development of new species is discussed.

It is suggested that for advancement in eugenics it would be more practical to study the existence of varietal characters in man than to investigate the inheritance of details. The occurrence of heritable aberrations should be determined and prevented.

The inheritance of head form in man [trans. title], K. Hildén (*Hereditas, 6 (1925), No. 1, pp. 127–146, figs. 3*).—Evidence is presented, based on the head measurements of parents and offspring, which indicates that head form in man as determined by the length-breadth index is due to the operation of multiple factors which are cumulative in their action. The short head appears dominant to the long head shape because there are a larger number of factors for short head than for the long head type.

A recessive form of congenital ophthalmoplegia [trans. title], P. J. Waardenburg (*Genetica [The Hague], 6 (1924), No. 5, pp. 487–492, figs. 7*).—The occurrence of ophthalmoplegia in two isolated families, which were related four generations back, was shown to behave as a simple Mendelian recessive, appearing only when heterozygous parents were mated. No matings of recessives were recorded.

The inheritance of body-weight in poultry.—I, In the Cornish-Hamburgh cross, H. G. May (*Rhode Island Sta. Bul. 200 (1925), pp. 4–34, figs. 18*).—The average monthly weights of White Cornish and Silver Spangled Hamburgh males and females, as well as the F_1 and F_2 offspring of each sex produced in reciprocal crosses between the two breeds, are tabulated and charted. Growth curves of the individual birds are also given.

The results showed that the rate of growth was essentially the same in the two sexes, though the males were approximately 25 per cent larger than the females. The length of the growing period was approximately 10 months in each breed, but since the Hamburgh only attained a weight of about two-thirds that of the Cornish, the rate of growth was slower in the former breed. A slight decrease in weight occurred in both breeds after the tenth month, which was later followed by a small increase, due to fattening. The F_1 and F_2 birds closely followed the Cornish breed in rate of growth up to 8 or 9 months, after which they were both somewhat intermediate between the Cornish and Hamburgh breeds. Much less variability was found in the weight of birds at 10 months than at 5 months, due to a greater effect of condition and environment prior to the latter period. No greater variability was found among the F_1 and F_2 birds than among the purebreds. Some differences in the growth of parents from crosses in different ways seemed evident, but this was attributed to differences in the care, etc., in the years during which the birds were raised.

The improvement of naturally cross-pollinated plants by selection in self-fertilized lines.—I, The production of inbred strains of corn, D. F. Jones and P. C. Mangelsdorf (*Connecticut State Sta. Bul. 266 (1925), pp. 348–418, figs. 47*).—Four varieties of corn, Burwell Yellow Flint, Gold Nugget (flint), Century Dent, and Beardsley Leaming were self-fertilized and selected for five generations. Of 86 lines started, 20 were lost or discarded. In the method followed, three progenies in each line were grown, and five of the most desirable appearing plants in the best progeny each year were self-pollinated.

Among the numerous distinct recessive abnormalities arising during the course of the inbreeding were chlorophyll deficient seedlings, golden plants, dwarfs, sterile tassels, barren plants without ears, ears with no silks, square cobs, seedlings with tube leaves, and plants with midribs in place of normal leaves. One strain had ears with many silks instead of one for each seed. In all except one case these were eliminated by the fifth generation. Significant differences in yield were not found between segregating and nonsegregating progenies in lines showing recessive abnormalities in the previous generation, and lines having recessive abnormalities at the start showed no greater reduction in yield during the five generations than lines that were free from them throughout the experiment.

All lines showed marked reduction in yield and a retardation of rate of growth. Although great differences were observed, no lines were as productive as the original variety. No appreciable correlation was found between the characters of the seed ear, weight of seed, size of seedling, or appearance of the plants at pollination and grain production in the same generation. Some correlation in certain characters was found between the first and last generations, particularly in height of plant and in percentage of moldy ears. Less association was noted in amount of tillering and in smut infection, while in productiveness practically no relation was found, demonstrating that good and poor yielding strains may come from plants productive or unproductive at the start.

"The one fact that stands out from the results secured in this selection experiment is that there is no single criterion by which high-yielding strains can be obtained. During the process of inbreeding, with the resulting segregation and recombination and the automatic elimination of heterozygous combinations of factors, selection for particular characters is somewhat effective. . . . But productiveness, yield of grain, which sums up the plant's entire energies shows no such simple relation. High yielding strains may come, and have come, from plants which are poor producers. Promising strains during the first generations may be very unproductive or undesirable in some respect when finally reduced to uniformity and constancy. This emphasizes the fact that effective selection must be based upon the performance of the plants after homozygosity is attained."

Contributions to the genetics of Brassica oleracea, K. B. Kristofferson (*Hereditas, 5 (1924), No. 3, pp. 297–364, figs. 24*).—Herein are presented, in a comprehensive manner, the results of studies in Mendelian inheritance between various forms of cultivated Brassica, namely, cabbage, kale, Brussels sprouts, broccoli, etc.

Heredity in sheep, J. A. Hill (*Wyoming Sta. Rpt. 1924, pp. 166, 171*).—In a study of the inheritance of characters of sheep through the crossing of purebred Hampshires with purebred Rambouillets, 12 lambs of the second generation have been produced. In body conformation they tended to resemble one or the other of their purebred grandparents more closely than their crossbred parents. The first generation showed a blend of the two breeds in body conformation, as well as in density of fleece and diameter of fiber.

W. B. Koehler studied the accuracy of the machinist's caliper for measuring the diameter of the wool fiber. A comparison of the measurements of this instrument with microscopic measurements showed that the latter were uniformly larger.

The hare-rabbit: A study in evolution by hybridization, W. E. Castle (*Amer. Nat., 59 (1925), No. 662, pp. 280–283*).—The author gives a brief account of results of attempts to cross the domestic rabbit with the Japanese subspecies of the European hare (*Lepus timidus ainu*) which was originally reported in Japanese by J. Yamane and T. Egashira. The experiments in attempting to cross hares and rabbits naturally were entirely unsuccessful. A method of artificial insemination of female rabbits was perfected whereby a female was allowed to copulate with a male rabbit rendered sterile by ligating the vasa deferentia. Following this, sperms taken from the epididymus of male rabbits were diluted with a 3.3 per cent solution of dextrose and injected into the uterus, 62.5 per cent of the trials being successful. When artificially inseminating female rabbits with hare sperm, however, 38 cases resulted negatively. It is concluded from the experiments that it is impossible to get hares and rabbits to mate naturally or artificially. The progress of evolution as a consequence of the hybridity of these animals thus becomes doubtful.

The corpus luteum of the ox ovary in relation to the estrous cycle.—Preliminary report, G. W. McNutt (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 5, pp. 556–597, figs. 31*).—This deals with the development of the corpus luteum in 19 cows killed at varying intervals following oestrum. Histological studies were made, and microphotographs and drawings are presented in addition to discussions of similar work by other investigators. An abstract of this paper was previously noted (E. S. R., 52, p. 631).

Studies of the estrous or genital cycle of the ox.—Second paper, H. S. Murphey (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 5, pp. 598–621, figs. 31*).—A more complete report of the work previously noted (E. S. R., 52, p. 631).

Description of a sex-intergrade opossum, with an analysis of the constituents of its gonads, C. G. Hartman and B. League (*Anat. Rec., 29 (1925), No. 4, pp. 283–297, figs. 11*).—The authors have described a sex-intergrade opossum possessing externally male sex characters (scrotum, penis, and general habitus) and internally infantile female sex characters (genital tract). Histological studies showed that the gonads located in the position of the ovaries contained large anovular Graafian follicles and thecae grouped about the rete, while sex cords were present in the cortex. It was suggested that this animal might be a reciprocal freemartin, but this was found improbable since further studies showed that only the first trace of sex differentiation could be detected in the opossum at birth. It was deemed more likely a case of sex reversal, as has been described in fowls.

On sex-intergrade pigs: Their anatomy, genetics, and developmental physiology, J. R. Baker (*Brit. Jour. Expt. Biol., 2 (1925), No. 2, pp. 247–263, pls. 2, figs. 9*).—The anatomy of the genital organs of nine sex-intergrade pigs is described.

These pigs were found to form a series grading from the complete to abortive development of the Müllerian and Wolffian ducts. The external genitalia were essentially female in type, but the individuals usually had the sex instincts of males, though periodically some showed signs of heat. Though the testicles and epididymus were usually well developed, the seminiferous tubules were degenerated. Two of the sex-intergrades were true hermaphrodites, each having an ovary on the left and an ovotestis on the right side. The ovaries present contained growing oocytes, and the closest approach to the normal sex of any of the individuals was to the female sex. These facts led the author to regard sex-intergrades as masculinized genetic females.

Information collected from farmers indicate that certain individuals tended to produce sex-intergrades. The ratio of normal to sex-intergrades among the offspring of parents siring intergrades was shown to be 8:1, the operation of two recessive characters thus being indicated.

Gonad grafts in embryonic chicks and their relation to sexual differentiation, A. W. Greenwood (*Brit. Jour. Expt. Biol., 2 (1925), No. 2, pp. 165–187, pls. 4*).—In studying the effect of tissue grafts on the developing embryos at the animal breeding research department of the University of Edinburgh, tissues from birds of various ages from 14-day embryos to 10 weeks old were grafted on the chorio-allantoic membranes near the intersection of two blood vessels of 540 7- to 9-day embryos in eggs laid by Light Sussex hens mated with Rhode Island red roosters. A few of the grafts were of thyroid, liver, spleen, heart, lens, Wolffian body, adrenal, kidney, pancreas, and gall bladder, but in most cases ovaries and testes were used.

A total of 150 embryos survived which had received gonad grafts, and the eggs were opened for examination on the seventeenth day. There was no deviation from the normal in the sex ratio, and the urogenital system was

normal for the sex as indicated by the color of the embryo. The histological condition of the gonads was also normal.

The author concludes "that the evidence derived from a study of gonad implants on the developing check does not support the contention that in the fowl the processes of sexual differentiation are capable of modification solely through the action of the gonadic implant." Two anatomically abnormal chicks were produced in the experiments, one having received a gall bladder graft and the other being a control.

The determination of secondary sexual characters in fowls: Experimental gynandromorphism [trans. title], A. PÉZARD (*Rev. Gén. Sci., 36 (1925), No. 2, pp. 37–47, figs. 10*).—A discussion of the gradual steps from the secondary characters of one sex to those of the other sex with reference to mosaic feathering and the experimental work previously noted (E. S. R., 53, p. 130).

FIELD CROPS

Symposium—economic relationships of agronomy (*Jour. Amer. Soc. Agron., 17 (1925), No. 4, pp. 189–252, figs. 14*).—The papers included in this symposium have been listed earlier (E. S. R., 51, p. 799).

The probable error in field experiments in agriculture, P. C. MAHALANOBIS (*Agr. Jour. India, 20 (1925), No. 2, pp. 96–116, figs. 8*).—In a critical discussion of the work of Sarkar with rice (E. S. R., 50, p. 536) from a statistical viewpoint, it is held desirable to adopt, wherever possible, the "direct difference" method for finding the probable error of a mean difference and to use Student's table for finding the probability. Wherever external variations are known to occur, their effect may be eliminated by considering departures from the "normal." In constructing the "normal" as many varieties as possible should be used, and preferably the results for each should be graduated separately and then combined after eliminating irregular sorts. In finding the probable error from small samples the observed standard deviations should be corrected with suitable factors. Statistically, a "subplot" method of laying out the field must be adopted in order to determine the reliability of the "normal" used.

[Field crops experiments in India, 1923–24] (*India [Dept. Agr.] Rev. Agr. Oper., 1923–24, pp. 2–34, 39–44, 53, pls. 2*).—Experiments with field crops (E. S. R., 51, p. 232) conducted by the imperial and provincial departments of agriculture in different localities in India are summarized for the year 1923–24.

[Field crops experiments in Bengal], R. S. FINLOW ET AL. (*Bengal Dept. Agr. Rpt. 1922–23, pp. 3–7, I–III, VI–XII, XIII, XIV, XVI–XIX, XXXIX–XLVI, XCIV–CI*).—The continuation of earlier work (E. S. R., 49, p. 734) is reported on.

[Field crops investigations in Punjab, India], M. SULTAN ALI, S. DARSHAN SINGH, H. R. STEWART, P. E. LANDER, and A. Y. ALI KAHN (*Punjab Dept. Agr. Rpt. 1923, pt. 2, I, pp. 2–11, 14–46, 47–52, 55–63, 65–73, 75–104; II, pp. 1–13, 17–70, 72–74, 86–99, 103–107, 125–142, 146–176*).—These pages supplement the previous note (E. S. R., 51, p. 137).

[Field crops work in Kenya, 1921–22 and 1922–23], A. HOLM, G. J. L. BURTON, G. M. HAMILTON, and E. HARRISON (*Kenya Colony Dept. Agr. Ann. Rpts. 1922, pp. 16–21, 117–122, 131–139; 1923, pp. 12–16, 86, 87, 97–102*).—Progress is reported of experiments along the same general lines as described earlier (E. S. R., 48, p. 629).

Hay as the cause of depraved appetite, and the importance of potash for plants [trans. title], T. HEDLUND (*Svenska Mosskulturför. Tidskr., 39 (1925),

No. 2, pp. 93–137, fig. 1).—The author points out that hay tending to cause depraved appetite in cattle is characterized by low alkalinity, the proportion of alkaline material to the dry matter content of the plant being little larger and sometimes even smaller than the proportion of chlorine and of sulfur. A high degree of alkalinity and a low crude fiber content are regarded as determining the quality of the hay, and attention is called to the fact that feeding on young grass does not cause this digestive disturbance.

The influence of growth conditions on the composition of grass and the resulting hay is considered, and the physiological and biochemical processes taking place are described with special reference to the mineral and fiber content of the plant. The application of sodium nitrate on areas producing hay causing depraved appetite increased the content of alkaline material, but it did not decrease the crude fiber content.

Comparative tests of alfalfa varieties [trans. title], N. Sylvén (*K. Landtbr. Akad. Handl. och Tidskr., 64 (1925), No. 2, pp. 133–135*).—The results of testing several varieties of alfalfa in different localities in Sweden showed that Ultuna alfalfa had been the most winter-resistant in the larger number of experiments, being followed by Grimm and Franconian. In some tests the first crop of Grimm, Franconian, and Cossack outyielded Ultuna. It is stated that weather conditions during the year they were sown placed the foreign varieties at a disadvantage. In 1924, when three cuttings were made, Franconian among the different varieties produced the best growth after the third cutting, followed by Grimm and Hungarian, while Ultuna produced the weakest growth among the varieties under test. Grimm alfalfa seed from different sources showed wide variations in yields, and for this reason it is considered desirable to breed for uniformity for the use of this variety in Sweden. The breeding experiments undertaken with the different sorts are briefly noted. For seed production planting in drills 1 meter apart showed an advantage over sowing broadcast.

Barley culture and barley experiments in Värmland [trans. title], G. Nilsson (*Sveriges Utsädesför. Tidskr., 34 (1924), No. 6, pp. 266–288, figs. 5*).—The comparative importance of the culture of barley and oats in Värmland, Sweden, is discussed, and the results of experiments showing the relative yielding capacity of the two crops, as well as of several varieties of barley in this region, are presented. The yields secured in experiments and in practice indicated that barley produced crops equal in value with those of oats. The variety of barley best suited to the region and its different soil types, as indicated by the comparative tests, was Gullkorn, with Asplundskorn, having a specially strong straw, standing second.

Berseem or Egyptian clover (Trifolium alexandrinum), P. B. Kennedy and W. W. Mackie (*California Sta. Bul. 389 (1925), pp. 32, figs. 12*).—The botanical characteristics and relationship of berseem clover, its origin, and behavior in Africa and elsewhere are reviewed with a discussion of varieties, the climate and soils of the Imperial Valley, results of experiments with the crop in California, cultural methods, feeding value (including analyses), rotations, weeds, pests, and a comparison with alfalfa.

In preliminary trials berseem gave much promise for forage and green manure as a new crop for the Imperial Valley. It is an annual legume which may be cut several times in one season, is alkali tolerant to a considerable degree, and as green fodder or as hay is more palatable and nutritious than alfalfa. It may be valuable in a rotation with sorghum, cotton, lettuce, and cantaloupes.

The function of lint hairs in the life history of the cotton plant, N. W. Barritt (*Ann. Appl. Biol., 11 (1924), No. 3–4, pp. 310, 311*).—"The evolution of lint hairs may be considered a special adaptation to climatic conditions,

Even to-day, notwithstanding the artificial extension of cotton areas, the varieties with most highly developed lint (e. g., Sea Island and Egyptian) are to be found only in climates with well-marked regular seasons, whilst the types with more fuzzy types of lint are found in more erratic climates."

Official standards of the United States for American cotton linters (*U. S. Dept. Agr., Bur. Agr. Econ., Serv. and Regulat. Announc. 94 (1925), pp. 9*).—Some of the attributes of the fibers adhering to the cotton seed after the long fibers have been removed at the gin are discussed by G. S. Meloy in order to differentiate this commodity from the cotton of commerce. The causes for the amount and character of the residual fibers are indicated, the methods of and reasons for cutting linters and their uses are described, and the official standards of the United States for American cotton linters are defined.

The application of an electrical method to the study of moisture absorption in cotton and its bearing on electrification in cotton, F. P. Slater (*Jour. Textile Inst., 16 (1925), No. 3, pp. P53–P60, figs. 5*).—The investigations described in this lecture demonstrated that the electrical conductivity of cotton or the rate at which intense local charges in cotton can be dissipated is increased when either or both the relative humidity or the temperature are raised. The relative humidity is the more important factor in the control of electrification. Over the ranges of relative humidities and temperatures obtaining in spinning practice the electrical conductivity doubles its magnitude for every 4 per cent rise in relative humidity or when the temperature is raised by about 16° F. For temperatures in ordinary practice the relative humidity should not fall much below 40 per cent if electrification is to be avoided. Between 55 and 60 per cent seems to be a convenient working range. For each per cent of relative humidity there are two equilibrium values of the conductivity, depending on whether the cotton has been previously exposed to an atmosphere of higher or lower per cent of relative humidity. The value when approaching from moister conditions is several times greater than that after drier conditions.

Rejto method of textile testing, J. Bercsi (*Textile World, 67 (1925), No. 17, pp. 53, 55, 57, figs. 7*).—The technique and apparatus used by A. Rejto in the mechanical examination of fibers and yarns at the textile laboratory of the Budapest Royal Joseph Technological University are described.

Some physical characteristics of jute [trans. title], H. Sommer (*Leipzig. Monatsschr. Textil Indus., 1924, pp. 412, 413; abs. in Melliand's Textilber., 6 (1925), No. 4, p. 273*).—The different characteristics of the several parts of the jute stalk have their basis in differences in lignification, which confer different specific weights on the sections. Differences are also seen in fiber strength and hygroscopicity. A higher content of hygroscopic moisture is found in the root end of the stalk. Comment is also made on the moisture content of jute during the spinning process.

The production and world importance of kapok [trans. title], H. Schaefer (*Tropenpflanzer, Beiheft, 22 (1925), No. 1, pp. 54*).—A discussion of the uses, consumption, natural culture conditions, extent of production in different countries, and preparation, marketing, and commercial movement of kapok fiber.

Proceedings of the eleventh annual meeting of The Potato Association of America (*Potato Assoc. Amer. Proc., 11 (1924), pp. 150, figs. 2*).—A report of the eleventh annual meeting of the association held at Washington in December, 1924, outlining the activities of the organization and of its committees in 1924. Among the papers included, several of which are abstracted below, are How to Improve the Yield and Quality of Seed Potatoes by Selection and to Maintain Such Improvement, by C. H. Myers; How Can Best Strains of a

Variety of Seed Potatoes Be Located and Maintained? by H. R. Talmage; Evidence that Certified Seed Is Improved Seed, by H. C. Moore; and Potato Observations Abroad, by W. Stuart.

According to a report rendered by H. O. Werner, the most noticeable changes or advances in certification work throughout the country seem to be more field inspections, improved grading of certified seed, more rigid control of virus diseases, use of trial plats for determining the quality of the work and efficacy of the standards and directly aiding the actual inspection work, and a very great increase in the volume of certified seed produced.

Variations in yield between seed stocks of a [potato] variety, F. A. Krantz and A. G. Tolaas (*Potato Assoc. Amer. Proc., 11 (1924), pp. 45–48*).—Comparisons in Minnesota did not demonstrate that factors other than diseases and storage are involved in the production of good seed potatoes. Variations in yield between seed stocks in comparative tests were found largely due to soil heterogeneity in the trial plat. Environmental differences as indicated by the yield the grower obtained, by the contents of nitrogen and dry matter, and by the tuber form of the seed did not influence the yield. If hereditary differences in yielding ability exist between seed stocks which are outwardly alike, they seem too small to be of commercial importance.

Soil type as a factor in seed potato production, E. V. Hardenburg (*Potato Assoc. Amer. Proc., 11 (1924), pp. 95–101*).—Varieties of potatoes were grown on six soil types, and data were obtained which in part supplement earlier work (E. S. R., 51, p. 340). The experimental results have generally substantiated the findings of others in showing that light or well aerated soils, other things being equal, are productive of large yields, more tubers per hill, and a potato of better table quality than are the heavier soils. Furthermore, recent experiments of the author indicated that the influence of soil type, per se, in respect to vigor and tuber set in the seed crop may be transmitted to the following crop. Further work seemed needed to verify these conclusions and to determine whether other factors affected by soil type may be similarly transmitted.

Effect of fertilizers on number and size of potato tubers, J. Bushnell (*Potato Assoc. Amer. Proc., 11 (1924), pp. 108–113*).—In a fertilizer experiment in progress 31 years at the Ohio Experiment Station and including potatoes, a deficiency of nitrogen, potassium, and phosphorus was found in the unfertilized plats. In analyzing the effects of fertilizer, the yield from the 1924 crop was integrated into number of tubers and size of tubers.

Nitrate nitrogen increased the number of tubers per plant but had no appreciable effect on the size of tubers, whereas potash had an opposite effect. Phosphate had no effect on number and comparatively little on size of tubers. As the soil had a high lime content the phosphate may have been largely converted into an insoluble form, which may account for the negative results from phosphorus.

Chemical changes accompanying tuberization in potato, J. T. Rosa (*Potato Assoc. Amer. Proc., 11 (1924), pp. 107, 108*).—Analyses at the University of California showed the most striking changes in composition associated with tuberization of normally growing plants in the field to be the accumulation of sucrose just before and during tuberization, and of starch and other polysaccharides especially during tuberization. It is said that where conditions prevent the accumulation of these substances tuberization does not occur.

Physiological shrinkage of potatoes, C. O. Appleman and W. D. Kimbrough (*Potato Assoc. Amer. Proc., 11 (1924), pp. 66, 67*).—Evaporation studies at the Maryland Experiment Station with potatoes dug at different stages of maturity and placed in two types of storage led to the conclusions that imma-

ture potatoes, dug when the skins slip easily, would lose under the same storage conditions 20 to 30 times more water during the first week of storage than during any week one month later. Mature potatoes would lose less than half as much water during the same period. Because of cork formation in the skins and possibly other internal changes the rate of evaporation from the tubers decreases rapidly during the first month of storage so that by the end of this period and during midstorage the amount of shrinkage by water evaporation appears to be controlled almost entirely by external conditions. During late storage the tubers under the same conditions will begin to give up water slightly faster, and when sprouting begins the water loss is further accelerated by evaporation from the sprouts. At all times the actual shrinkage of potatoes due to loss of water depends upon storage conditions favoring or suppressing evaporation. Storage conditions most favorable for one period in the storage life of potatoes may not be the best for all other periods.

The relation of respiration to storage and transportation of potatoes, W. D. KIMBROUGH (*Potato Assoc. Amer. Proc., 11 (1924), pp. 53, 54*).—After potatoes were stored at 32, 36, 40, and 72° F. for different periods at the University of Maryland the respiration rates were determined at constant temperatures of 86, 72, and 63°, respectively.

The initial rates of respiration in potatoes from different storage temperatures varied with the storage temperature. The maximum rate of respiration in potatoes from a given storage temperature varied with the temperature at which respiration determinations were made. Considering rate of initial respiration when potatoes are removed from storage, a storage temperature of 40° is much better than the lower storage temperatures tested. After one month of storage the period in the storage life of the tubers does not seem to influence materially the initial rate of respiration when the potatoes are removed to higher temperatures.

Report on potato dormancy abbreviation experiments, J. T. ROSA (*Potato Assoc. Amer. Proc., 11 (1924), pp. 48–52*).—Treating rather immature dormant seed potatoes with solutions of different oxidizing agents (E. S. R., 50, p. 536) will give increased stands, prompter germination, and considerably enhanced yields under rather trying field conditions, according to results at the University of California. Solutions of a given strength or treatments for certain time were considerably more toxic to the seed pieces in hot weather than in the cooler part of the year. Seed piece decay, whether treated or untreated seed are considered, is a major factor in explaining the poor stands of second-crop potatoes under California conditions.

Of 10 varieties tested, White Rose appeared best suited to fall crop purposes from the viewpoint of quick germination and rapid growth. Indications are that treatments fairly effective in stimulating the sprouting of dormant White Rose tubers may be less effective on other varieties with deeper dormancy.

Potato growing in Ohio, N. W. GLINES (*Ohio Agr. Col. Ext. Bul., 20 (1924–25), No. 8, pp. 16, figs. 9*).—Practical information on growing the crop in Ohio with notes on production costs.

Rice: Its cultivation and preparation, C. E. DOUGLAS (*London and New York: Isaac Pitman & Sons, Ltd., [1925], pp. IX+143, pl. 1, figs. 29*).—This handbook traces rice production from planting to food product, discussing the history, botanical characteristics, production, and commercial movement of the crop, cultural and field practices, harvesting and milling methods, storage, crop pests, and utilization of rice.

Soybeans for Iowa, H. D. HUGHES and F. S. WILKINS (*Iowa Sta. Bul. 228 (1925), pp. 345–405, figs. 18; abridged ed., pp. 16, figs. 7*).—Varietal, seeding, and cultural tests with soy beans are reported on, with comment on uses of the

crop, varieties, place in rotation, inoculation, cultural methods and harvesting practices, curing hay, breeding work, and seeding soy beans and grain in mixtures.

Manchuria soy beans are recommended for seed production and Peking for hay and silage. Varieties are indicated for different parts of the State, and the most important ones are described. Soy beans have proved superior to cowpeas and field beans at the station.

Planting twice as much seed per acre as ordinarily recommended consistently gave the most profitable yields of seed and hay. Soy beans in cultivated rows gave the most profitable yields with seed planted 1 in. apart, requiring about 60 lbs. of average-sized beans per acre. Growing the crop in rows closer than 36 in. is not generally advised, although somewhat larger yields were had in rows 21 and 30 in. apart. Hay and seed yields produced when the crop was drilled like small grain exceeded those obtained in cultivated rows. Two bu. of seed of the most commonly grown varieties is indicated when the crop is drilled, the rate varying with the variety. Drilled seedings have given higher yields with less weed competition than broadcast seedings. The most satisfactory time to plant soy beans is from 1 to 2 weeks later than corn. If kept free from weeds plantings from April 19 to June 30 usually can make satisfactory yields. Killing the weeds before planting soy beans is considered advisable. A small amount of Sudan grass seeded in soy beans sown for hay reduced the weeds in the hay and eliminated the need for cultivation.

Until 6 in. high a growing crop should be harrowed whenever many germinating weed seed are observed. Drilled seedings should generally be harrowed when 0.5 in. high, when 3 in. high, and again when about 6 in. high.

Investigations to date indicate that mottling is not due to readily controllable cultural practices. Studies in progress suggest that mottling may be due to conditions favoring the formation of excesses of anthocyans and tannins, which appear to radiate principally from the seed scar. The fact that mottling occurs much more generally on the seed of some varieties than on others grown under like conditions indicates that certain sorts are more susceptible to the physiological conditions referred to, or perhaps carry more genetic factors for mottling.

Comparative experiments with sugar beets in Czechoslovakia [trans. title] (*Ztschr. Zuckerindus. Čechoslovak. Repub.*, *49* (*1925*), *Nos. 21, pp. 155–162; 22, pp. 166–170; 23, pp. 171–177; 24, pp. 179–183*).—Ten sorts of sugar beets, five from native seed and five from foreign seed, were compared in 1924 in five localities in Bohemia, four in Moravia, and one in Slovakia. Zapotil I, Dippe W. I., Dobrowitz, and Mandelik led in sucrose content; Kleinwanzleben, Zapotil II, and Dobrowitz gave the highest yields of beets; and Dobrowitz, Zapotil II, Zapotil I, and Kleinwanzlehen were foremost in sugar production.

Chemical factors determining the quality of tobacco, V. GRAHAM and R. H. CARR (*Jour. Amer. Chem. Soc.*, *46* (*1924*), *No. 3, pp. 695–702*).—Investigations were made at Purdue University to determine the chief features of tobacco grown on different soil types and in different climates and to detect variations in composition between commercial forms of tobacco. The material tested included Burley grown in Indiana and receiving different fertilizers and lime, varieties from Wisconsin, Connecticut, and Kentucky, certain popular smoking tobaccos, and several brands of cigars.

Extraction of tobacco samples with different solvents in the order of their relative solubilities has been found useful in grading tobacco, there being a relation between grades and order of solubility. Cigar tobacco of good quality has a small percentage of extractives and nicotine, while smoking tobacco has a

high solubility in petroleum ether, ethyl ether, and alcohol. Plants with a high calcium content had most of their nicotine combined in such stable form as to be quite insoluble in petroleum ether or ethyl ether. The vegetable waxes, volatile oils, and loosely combined nicotine contained in the petroleum ether extracts are held largely responsible for the irritating effect of tobacco. Tobacco could be greatly improved by extraction with this solvent.

The ratio of leaf to stalk was much greater in Switzerland County (Miami clay loam) than in Tippecanoe County, Indiana (Sioux silt loam). The ash content averaged about 3 per cent lower for tobacco grown on the silt loam than for that from the clay loam soil. The fertilizer results agreed in general with those reported from the Ohio Experiment Station (E. S. R., 33, pp. 731, 732).

Plants which had been variously fertilized with acid phosphate had a small petroleum ether extract and possessed the most agreeable aroma. Although the composition of tobacco may be greatly modified by fertilizer treatment, the tobacco commanding the best price was grown on relatively poor sandy or clay soil, unsuited to corn, but producing a leaf characterized by a low percentage of extractives, proteins, and nicotine, and suitable for making a cigar of pleasing taste and aroma.

Common vetch, H. A. Schoth and G. R. Hyslop (*Oregon Sta. Bul. 213 (1925), pp. 3–29*).—The environmental needs of common vetch (*Vicia sativa*) are described and cultural and field practices and harvesting and threshing methods outlined. Information on handling the crop for seed, hay, silage, green feed, and green manure and in rotation is summarized, with comment on insects and diseases attacking vetch, varietal characteristics, and breeding work. Much of the experimental work, carried on in cooperation with the U. S. Department of Agriculture, has been noted earlier (E. S. R., 49, p. 525; 51, p. 529; 52, p. 535).

Moisture determination in seed [trans. title], Y. Buchholz (*Tidsskr. Norske Landbr., 31 (1924), No. 12, pp. 447–451*).—This paper, presented July 8, 1924, at the Fourth International Seed Control Congress convened at Cambridge, England, points out the divergence in results that may arise under different methods of moisture determination, and gives in tabular form the data secured in a series of comparative tests with oats, barley, rye, timothy, red clover, alsike clover, turnips, and meadow foxtail. One set of samples was prepared in the ordinary way by crushing large seed and leaving small seed whole, while the other set was ground to pass through a 1-mm. mesh sieve. The samples were then dried at 98 and 103° C. (208.4 and 217.4° F.) and the moisture loss determined after four and five hours of drying. The average moisture loss in the finely ground samples was about 0.5 per cent higher than in the samples prepared in the ordinary way, and drying at 103° increased the moisture loss by about 0.75 per cent over drying at 98°. The increase in the loss of moisture from the samples when drying was continued for an additional hour was not very significant.

The eradication of Cyperus rotundus L., S. B. Ranade and W. Burns (*India Dept. Agr. Mem., Bot. Ser., 13 (1925), No. 5, pp. 99–192, pls. 8, figs. 9*).—The botanical and ecological characteristics and relations of *C. rotundus* and its anatomy are described, together with reports of extensive experiments concerned with its propagation by seed and by tubers, and the effectiveness of spraying with chemicals, repeated removal of shoots, covers, and cover crops, and cultivation in its control. Some of the experimental findings have been recorded earlier (E. S. R., 50, p. 238; 52, p. 830).

Most significant in the research was the fact that tubers exposed on the surface of dry soil or not deeper than 3 in. in dry soil are killed in 8 days

if the exposure is during hot weather. While smother crops and covers were largely ineffective or impractical, sunn hemp distinctly reduced the tuber population.

The weed must be attacked as soon after the rains as the soil is workable in the method suggested by these studies. Deep plowing should be followed by pulverizing and thorough turning of the broken soil to expose to the sun as many tubers as possible. If the land will not be cropped during the following rains, a dense green manure crop should be grown, plowed in early, and followed by continuous cultivation in a second dry season, which should leave the land clear of weeds. If the land is needed for a rains crop, the latter should be so seeded that it can be continuously intercultivated to keep down the *C. rotundus* shoots and prevent aerial connection and tuber formation. Cultivation during a second dry season should then reduce the weed, and a third season's work kill it.

HORTICULTURE

[Horticultural investigations at Cheshunt, England] (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 10 (1924), pp. 11–65, pls. 2*).—In general continuation of glasshouse investigations (E. S. R., 52, p. 233), there are reported the results of fertility and varietal studies in 1924. In order to overcome differences due to disease organisms, the plats in the tomato experiments were steam sterilized previous to setting of the plants.

A comparison of bone meal and bone flour with basic slag as sources of phosphoric acid for the tomato again showed only insignificant differences. The application of increasing amounts of phosphoric acid to a soil from which this material had been purposely withheld during the preceding seven years yielded confusing results, although the maximum yield was obtained on the heavily phosphated area. However, with nitrogen and potassium yields showed a consistent increase with the increasing size of the application. In fact, the high-yielding potassium and nitrogen plats were the most productive in the entire series. As compared with the preceding year the majority of the plats showed considerably increased yields, a situation believed due to the steam sterilization. As in 1923, the use of nitrogen decreased the percentage of blotchy fruits.

In another series, it was found that doubling the usual application of complete fertilizer tended to reduce rather than stimulate yields. In all cases complete fertilizer and fertilizers lacking in one of the three important elements gave larger yields than did the control, unmanured areas. However, the areas from which potassium and nitrogen were, respectively, omitted were low in production.

A study of methods of applying fertilizers to the tomato indicated that base dressings are more effective than either top dressings alone or in combination with base dressings. Records taken on seven forcing tomatoes showed the following ascending order of yields: Comet, Balch Gem, Kondine Red, Le Croix, Ailsa Craig, Riverside Favorite, and Radio.

The second season's results in a study begun in 1923 upon the effect of growing tomatoes year after year in the same soil showed decreasing yields except on areas fallow in 1923. For example, in an unmanured section the 1923 fallow plats produced in 1924 46.4 tons per acre as compared with 25.6 tons for the area used in 1923. This striking increase is thought to be due to the decomposition of turf originally incorporated in the soil and unused in 1923.

The resteaming of a cucumber bed which was not sterilized the preceding season failed to produce significant results because of unfavorable weather conditions. Furthermore, steaming had an apparent retarding effect on the production of early fruit. The incorporation of animal manures in the soil previous to steaming was effective in increasing yields above that of an unmanured but steamed bed. In beds underlaid with concrete, careful sterilization did not increase yields above those of similar beds in which the bottom 3 in. soil layer was from an old infected house. However, in another house in which old beds were merely respaded and renourished with manure, steaming was effective in prolonging the life of the plants and increasing yields. The results indicate that with effective steam sterilization cucumber soils may be economically used for more than one season.

Plats which from 1919 to 1923 had been subject to various sterilization treatments showed a slight hold-over effect of previous treatments in 1924, the carbolic acid area maintaining a slightly lower and the hot water and steam areas slightly higher productions than the control. Other tests indicated that cresylic acid and heavy oil in water were effective soil sterilizers.

Popular gardening annual for 1925, edited by H. H. THOMAS (*London and New York: Cassell & Co., Ltd., 1925, pp. VI+154, pls. 31, figs. 50*).—General information for the practical gardener.

Vegetables, R. DE NOTER (*Nos Bons Légumes. Paris: Garnier Bros., 1924, pp. VIII+177, figs. 25*).—This comprises brief notes on culture and utilization.

Commercial cucumber culture (*London: Ernest Benn, Ltd., 1924, pp. 46*).—An English pamphlet relating to hotbed and glasshouse cucumber production.

Spinach fertilizers.—Second report, H. H. ZIMMERLEY (*Virginia Truck Sta. Bul. 48 (1924), pp. 351–356*).—Continuing earlier work (E. S. R., 51, p. 642), in which it was shown that fertilizers containing a high percentage of quickly available nitrogen are valuable for winter-grown spinach, the author reports upon the results of studies during 1923 and 1924 upon the relation of the time of application to yields.

Records taken in 1923 upon four beds to which high-grade fertilizer was applied as follows, (1) none previous to planting, top-dressed later with 1,200 lbs. per acre in three equal applications; (2) 400 lbs. previous to planting, top-dressed later with 800 lbs. in two applications, (3) 800 lbs. previous to planting, top-dressed later with 400 lbs. in one application, and (4) 1,200 lbs. previous to planting, none later, show 129.1, 154.9, 159.4, and 154.7 bbls. per acre for the respective treatments. In 1924 the yields resulting from the same treatments were, respectively, 72.9, 120.6, 131.1, and 95.6 bbls., further indicating the value of applying part of the fertilizer previous to planting. On soils of light texture it is recommended that a considerable part of the nitrogen in the preplanting fertilizer be in a slowly available form, such as tankage. In subsequent top dressings the nitrogen should be in a rapidly available form, such as nitrate of soda or ammonium sulfate.

Carbon dioxide investigations [at Cheshunt, England], O. OWEN and P. H. WILLIAMS (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 10 (1924), pp. 105–109, fig. 1*).—Continuing investigations previously reported (E. S. R., 52, p. 234), studies were made of the effect of various amounts and manners of application of CO_2 upon the tomato. Results indicated that a distinct benefit accrues from the use of CO_2 in moderate amounts after the plants are set in the beds, the highest yielding plat being that which received 0.6 per cent of CO_2 for one hour daily after the plants were set out. The slow emanation of gas from perforated pipes laid upon the soil surface did not give promising results. The highest gas concentration, 0.9 per cent, attained in the tests proved benefi-

cial. An examination of tomato roots showed that the attack of root rot (*Colletotrichum tabificum*) was severest in the chamber receiving the largest doses of CO_2.

Fruit growing, W. H. CHANDLER (*Boston: Houghton Mifflin Co., 1925, pp. XV+777, figs. 60*).—Designed primarily for the research worker and the student, this text, containing nearly 1,400 citations to the literature, presents a comprehensive survey of the present knowledge in scientific pomology.

The culture of fruit trees, G. DERVAUX (*La Culture des Arbres Fruitiers. Paris: Garnier Bros., 1924, pp. VII+229, figs. 128*).—This comprises general information regarding propagation, pruning, culture, etc.

A, B, C, D of pruning fruit trees, R. DE NOTER (*A, B, C, D de la Taille des Arbres Fruitiers. Paris: Garnier Bros., 1924, pp. VI+111, figs. 143*).—A small pruning manual prepared for use in France and northern Africa.

Practical pruning, J. W. MORTON (*London: Lockwood Press, [1925], pp. [2]+137, pl. 1, figs. 44*).—A small handbook prepared for the English grower.

The Lorette system of pruning, L. LORETTE, trans. by W. R. DYKES (*London: Martin Hopkinson & Co., Ltd., 1925, pp. XLIV+166, figs. 173*).—A translation of a French text devoted for the greater part to an explanation of an improved method of summer pruning which has proved singularly successful in promoting and maintaining productivity in deciduous fruit trees.

The treatment of seedling apple trees to induce early fruiting, G. T. SPINKS (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3–4, pp. 141–145*).—Attempts to induce early fruiting in seedling apples by various pruning and manuring treatments were unsuccessful, according to records taken at the end of the fifth growing season. Root pruning and girdling tended to reduce the size and vigor of the trees, and to all appearances retarded the inception of fruit production as compared with untreated or manured trees. On the whole, the more vigorous trees appeared to be nearer a bearing condition, leading the author to suggest that probably the best way to obtain early fruiting is to encourage vigorous, healthy growth. Girdling is deemed of value for trees remaining barren after reaching a fruiting age.

Pear pollination [trans. title], E. H. FLORIN (*Meddel. Perm. Kom. Fruktodlingsförsök [Sweden], No. 5 (1925), pp. 38, figs. 9*).—Beginning with a comprehensive review of pear pollination studies in the United States, England, The Netherlands, and Germany, the author discusses investigations conducted in southern and central Sweden.

In southern Sweden where the observations were generally limited to records of the number of immature fruits formed, such well-known varieties as Bartlett, Clapp Favorite, Beurré Hardy, and Belle Lucrative were found practically self-sterile. One variety, Clara Frijs, was self-fruitful in southern Sweden and self-sterile in central Sweden. Lübeck Bergamotte proved self-fertile at both localities.

Among desirable combinations found in crossing tests with numerous varieties are listed Bartlett ♀ × President Drouard ♂, President Drouard ♀ × Flemish Beauty ♂, Alexander Lucas ♀ × Flemish Beauty ♂, and Moltke ♀ × Belle Lucrative ♂.

Heavy losses follow late stratification of plum and cherry seeds, C. F. SWINGLE (*Natl. Nurseryman, 33 (1925), No. 8, pp. 197–200, figs. 6*).—Working with seeds of the mazzard and mahaleb cherries, Lombard and myrobalan plums, and Abundance seedling plums, the author found that in general the sooner that seeds are stratified following maturity of the fruit the better the germination. Of 7,600 seeds stratified later than October, about 1 per cent germinated and over half of these were in a single mahaleb lot picked ripe

from one tree. As indicated by an examination of embryos, seeds from individual trees within a species or variety varied in their viability, and the percentage of apparently good seed and actual germination were higher in fully matured seeds. With mazzard, the best results were secured with immediate stratification following the maturity of the fruit, while with the mahaleb and the plums only slight falling off was noted up to October.

The relation of soil moisture and nitrates to the effects of sod on plum and cherry trees, T. L. LYON, A. J. HEINICKE, and B. D. WILSON (*New York Cornell Sta. Mem. 91 (1925), pp. 3–21, figs. 3*).—In accordance with a similar experiment with apples (E. S. R., 49, p. 235), data are presented concerning the responses of young Montmorency cherry and Shropshire plum trees to certain soil treatments.

Beyond uniform shaping at time of setting, the trees received no further pruning. To each of 32 0.01-acre plats containing 10 plum and 10 cherry trees, there was applied annually 4.5 lbs. of acid phosphate and 2.4 lbs. of muriate of potash. Arranged in pairs, one plat was maintained continuously in timothy sod and the other in culture with annual rye cover crops. The variable factor in the experiment was the amount of nitrate of soda, which was applied at the rate of 0, 100, 300, and 900 lbs. per acre for two years and in double quantities the third year.

The heavy applications of nitrate of soda stimulated the growth of both cherry and plum trees in sod and of the cherry in tillage, but had no effect on plums in tillage. The cherries in nitrated sod were almost as large as cultivated trees, whereas the plums in sod were only about two-thirds as large as tilled trees. Except following the applications of large quantities of nitrate of soda, nitrate nitrogen was found to be deficient under sod. Furthermore, tree growth on the sod plats corresponded directly with the size of the nitrate applications, indicating a deficiency of available nitrogen under nonnitrated sod. That a deficient nitrate supply was a more potent factor in limiting growth than was moisture loss due to grass was shown in the fact that the growth of trees was greatest on sod plats in which soil moisture was least owing to the greater growth of grass incident to heavy applications of nitrate of soda. Furthermore, in 1921, a dry season, the trees on many of the sod plats made greater gains in trunk girth than in 1922, a year of abundant rainfall. The results of the investigation led the authors to conclude that apparently, for the soil type concerned, the maintenance of an adequate supply of nitrate nitrogen was a more determining factor in tree growth than was the supply of available soil moisture.

Pollination and growing of the cherry, C. E. SCHUSTER (*Oregon Sta. Bul. 212 (1925), pp. 4–40, figs. 14*).—This is prepared in two parts, the first of which, entitled Pollination of the Cherry, discusses the results of miscellaneous investigations with sweet and sour cherries. Finding that little natural crossing occurred in uncovered, emasculated, and depetaled blossoms, and that better sets of fruit were secured than in bags, this method of technique was adopted. Germination tests of pollen in 12 per cent sugar and 1 per cent gelatin showed excellent viability in most of the varieties. Three important commercial varieties, namely, Bing, Napoleon, and Lambert, were found to be not only self- but also intersterile. However, tests showed that certain other varieties, such as Black Tartarian, Norma, and Elton, were satisfactory pollinizers for these varieties. Conflicting results attained in pollination of cherries are believed to be due in many cases to the occurrence of seedlings so nearly like existing varieties that they are easily confused. Records were taken upon the pollinating capacities of single trees in an attempt to isolate effective pollinizers, with the expectation of propagating and disseminating the same.

Preliminary studies with sour cherries indicated that both self- and intersterility occur frequently in this group, according to the variety and the combination of varieties. Montmorency, the leading commercial sour cherry, was found to be self-sterile, but fruitful when pollinized with either Early Richmond or English Morello. Practical suggestions are offered for planting orchards with the view to insuring adequate pollination.

Part 2, entitled Planting and Care of Cherries, contains general information concerning varieties, propagation, location of sites, planting, fertilizers, pruning, harvesting, etc.

Cherry pollination, R. FLORIN (*Die Bestäubung der Kirschblüte. Frankfort on the Oder: Trowitzsch & Son, [1924], pp. 32*).—This, a German translation of a paper delivered before the Swedish Pomological Society at Goteborg in September, 1923, is a concise review of cherry pollination investigations in Sweden, the United States, England, The Netherlands, and Germany, supplemented with general information on the physiology of pollination, the function of bees, and practical advice for the fruit grower.

Breeding experiments with blackberries and raspberries, H. NESS (*Texas Sta. Bul. 326 (1925), pp. 3–28, figs. 12*).—This is a further presentation (E. S. R., 48, p. 445) of information upon small fruit breeding activities, setting forth the various species and varieties utilized and describing characteristics of some of the resulting seedlings. Especial attention is devoted to the origin of the Nessberry, a multiple selection from the F_3 generation of a cross between *Rubus rubrisetus* ♀ and Brilliant ♂ (*R. strigosus*). The Nessberry, self-fertile and hybridizing readily with other forms of Rubus, is described as an extremely vigorous grower and high producer of large, dark cherry-colored fruits, mildly acid and raspberry-like in flavor.

Black currant variety trials: Reliability of results, R. G. HATTON, N. H. GRUBB, and R. C. KNIGHT (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3–4, pp. 200–220, fig. 1*).—Submitting to a careful biometrical analysis individual plant records taken on black currants representing 5 varieties, namely, French, Seabrooks, Boskoop, Goliath, and Baldwin, it was found that of 40 possible comparisons between pairs of varieties, only 31 showed significant differences, notwithstanding that each plat included from 60 to 70 bushes. Based on the results, a table is presented showing the number of bushes required to reveal a given difference and, conversely, the differences that may be considered significant with plats of various populations. Of the 5 varieties, the Baldwin led both in yield and in returns per acre.

A study of the yields of pruned and unpruned Baldwin plants showed that pruning markedly increases the probable error. Attempts to isolate persistent high and low yielders showed that only a few bushes possessed such tendencies. However, many bushes were found with the tendency to high and low yields in alternate years, suggesting an inclination in the black currant toward biennial fruiting.

Smyrna fig culture, C. G. SAVAGE (*So. Aust. Dept. Agr. Bul. 186 (1925), pp. 20, figs. 8*).—General cultural information.

Banana cultivation in the Canary Islands (*Bul. Imp. Inst. [London], 23 (1925), No. 2, pp. 168–174, pls. 4*).—A discussion of methods and practices utilized in banana production in the Canary Islands.

Manual of agriculture in the Island of Fernando Po.—Cacao, J. R. BARRERA (*Manual del Agricultor en Fernando Póo. El Cacao. Barcelona: Artes Gráficas, 1924, pp. 129, pls. 20*).—A small manual containing general information concerning the growing of cacao and protection against diseases and insects.

Citrus fruit growing in the Southwest, A. D. SHAMEL, C. S. POMEROY, and R. E. CARYL (*U. S. Dept. Agr., Farmers' Bul. 1447 (1925), pp. II+42, figs. 17*).—

A general discussion covering the various phases of citrus production, including the development of the industry, varieties, improved strains, propagation, selection of planting sites, planting operations, culture, fertilization, pruning, harvesting, marketing, etc.

Coffee, R. H. Cheney (*New York: N. Y. Univ. Press, 1925, pp. XVII+244, figs. 77*).—A monograph of the economic species of the genus Coffea.

Fertilization of pineapples, R. E. Doty (*Hawaii Univ., Ann. Short Course Pineapple Prod., 3 (1924), pp. 3–24, figs. 6*).—Investigations of the fertilizer requirements of the pineapple indicate that, while nitrogen from any source favorably affects yield, ammonium sulfate, ammonium nitrate, and potassium nitrate are the preferred carriers. Phosphorus and potassium used separately as supplements to nitrogen did not increase yields beyond nitrogen alone. Substantial gains were noted from the use of complete fertilizers on average virgin soils.

Gladioli, A. J. Macself (*London: Thornton Butterworth, Ltd., 1925, pp. 158, pls. 12, figs. 22*).—Illustrated in part in color, this text contains general information regarding species and varieties and general culture.

Bearded iris: A perennial suited to all gardens, A. W. W. Sand (*N. Y. Agr. Col. (Cornell) Ext. Bul. 112 (1925), pp. 92, figs. 47*).—This comprises general information concerning varieties, classification, propagation, hybridizing, and utilization.

FORESTRY

Silviculture upon natural principles, H. Mayr (*Waldbau auf Naturgesetzlicher Grundlage. Berlin: Paul Parey, 1925, 2. ed., pp. VIII+568, pls. 3, figs. 27*).—A second and unmodified edition of a previously noted work (E. S. R., 20, p. 943).

Manual of the forest trees of the Belgian Kongo, C. Vermoesen (*Manuel des Essences Forestières du Congo Belge. Brussels: Min. Colon., Dir. Agr., 1923, pp. XII+282+[7], pls. 27, figs. 43*).—Illustrated in part in color, this handbook contains descriptive material relating to the trees, foliage, and wood, with suggestions as to value and utilization.

The hardiness of exotic conifers in Sweden [trans. title], N. Sylvén (*Meddel. Statens Skogsförsöksanst. [Sweden], No. 21 (1924), pp. 101–148*).—A succession of two extremely severe winters, 1915–16 and 1916–17, afforded an opportunity for a critical test of the comparative hardiness of exotic conifers, data upon which are herein presented, based on observations taken in several localities in Sweden.

Boxwoods, S. J. Record and G. A. Garratt (*Yale Univ. School Forestry Bul. 14 (1925), pp. 81, pls. 8, figs. 3*).—Herein are presented technical descriptions of the true boxwood (*Buxus sempervirens*) and of various species, including the common American dogwood (*Cornus florida*), which have been or are still being utilized as substitutes. Keys based on bark characteristics and upon macro- and microscopic features of the wood are offered for the determination of the various species.

Volume tables for Tectona grandis (teak) and Shorea robusta (sal) for the Central Provinces; local definitions of timber, V. K. Maitland (*Indian Forest Rec., 11 (1925), No. 7, pp. [3]+8, pls. 4*).—Approximately 2,000 teak and 1,000 sal trees were used in the preparation of the tables herein presented.

Report of the forest branch of the Department of Lands, [British Columbia], for the year ending December 31st, 1924, P. Z. Caverhill et al.

(*Brit. Columbia Dept. Lands, Forest Branch Rpt. 1924, pp. E50, pls. 6, figs. 3*).—The usual annual report (E. S. R., 52, p. 241).

Report of the forestry branch, [Ontario], 1924 (*Ontario Min. Lands and Forests Rpt. 1924, pp. 83–133*).—Included herein is information relating to general activities, fire protection, air operations, reforestation, nursery stock production, timber sales, etc.

Fifth annual report of the forestry commissioners [for the] year ending September 30th, 1924, LOVAT ET AL. (*[Gt. Brit.] Forestry Commrs. Ann. Rpt., 5 (1924), pp. 43, pls. 2*).—Following a brief review of the initial five years' work, 1919–1924, there is presented in the usual manner (E. S. R., 51, p. 750) a statement concerning activities during the year ended September 30, 1924. In this period a total of 10,519 acres, of which 10,065 were conifers, were planted. Forest fires were extremely severe during the early part of the year, February and March.

Annual report of the Forest Department, [Union of South Africa], year ending 31st March, 1924, C. E. LEGAT (*Union So. Africa Forest Dept. Ann. Rpt. 1923–24, pp. 30*).—A general report upon activities during the year ended March 31, 1924, discussing such matters as the management of the State forests, planting operations, natural regeneration following fires, etc.

Report of the forest administration in the Bombay Presidency, including Sind, for the year 1923–24, W. E. COPLESTON (*Bombay Forest Admin. Rpt. 1923–24, pp. III+221+3*).—The customary report (E. S. R., 51, p. 44) relating to general silvicultural operations, alterations in forest areas, construction activities, protection, income, expenditures, etc.

The Bombay forests, W. E. COPLESTON (*Bombay: Govt., 1925, pp. [3]+57, figs. 28*).—After pointing out the value of forest conservation to all classes of people, the activities of the forest department are discussed in a popular way, so as to bring them to the attention of the layman.

DISEASES OF PLANTS

A survey of the evidence indicating that Phytophthora should be merged with Pythium, H. H. FITZPATRICK (*Abs. in Phytopathology, 13 (1923), No. 1, p. 34*).—Attention is called to the fact that there is at present no known basis for the satisfactory separation of Pythium from Phytophthora, and a proposition is offered by the author to merge these two genera under the older name Pythium. It is also recommended that the Pythiaceae, consisting then of the resultant genus and its nearest relatives, be regarded as a distinct family of the Peronosporales.

The location of the crown-gall organism in its host tissues, A. J. RIKER (*Abs. in Phytopathology, 13 (1923), No. 1, p. 43*).—During inoculation studies with crown gall on tomato stems, it was noted that liquid flowing from the needle and forming intercellular water-soaked areas marked accurately the seats and sizes of the crown galls which developed subsequently. The bacteria were attracted chemotactically by expressed tomato sap, migrating through the water-soaked tissue and appearing in galls arising several centimeters from the wound. The bacteria were observed to be intercellular and to develop consistently in areas showing development of hyperplasia, hypertrophy, and vascular structure. They were numerous, but appeared to be intercellular.

Some morphological responses of the host tissues to the crown-gall organism, A. J. RIKER (*Abs. in Phytopathology, 13 (1923), No. 1, p. 43*).—The crown gall organism begins its relations with the host in the liquid released by the wound, which is found to flood the neighboring intercellular spaces, from

which position the bacteria stimulate some neighboring cells to divide into smaller cells, forming a region of hyperplasia, beyond which region the cells often react to form a region of hypertrophy. When bacteria are distributed through the intercellular spaces for some distance, the subsequent division of the surrounding cells forms a tumor strand. Though heavy inoculation near a growing point may prevent elongation, the flooding of intercellular spaces and the normal elongation may separate the bacteria and the resulting secondary galls for varying distances from the point of inoculation.

Temperature studies in mosaic diseases, B. T. DICKSON (*Abs. in Phytopathology, 13 (1923), No. 1, p. 42*).—Color and vitality differences accompanying growth under unlike top and root temperatures of healthy and of mosaic tobacco plants are described. Later leaves were poorly developed, but there was no cessation of infectivity.

Temperature studies in mosaic diseases, B. T. DICKSON and E. G. HOOD (*Abs. in Phytopathology, 13 (1923), No. 1, p. 42*).—Thermocouple tests for subnormal or supernormal temperatures in mosaic diseased tobacco, potato, bean, and clover plants have not yet shown any constant temperature differences, but the tests are to be continued with more delicate couples.

The occurrence of protozoa in plants affected with mosaic and related diseases, R. NELSON (*Abs. in Phytopathology, 13 (1923), No. 1, p. 41*).—An intensive study of bean mosaic, clover mosaic, tomato mosaic, and potato leaf roll gave constant demonstration of definite associated protozoan organisms, mainly in the sieve tubes. The bean and clover organism is a biflagellate, elongated protozoan, generically near Leptomonas, and supposedly of new generic rank. The organism in mosaic tomato appears to be a trypanosome, or closely related thereto, and it has been found only in the sieve tubes. In leaf roll potato plants organisms resembling trypanosomes more than any other form were found in close association with the nucleus, sometimes coiled around it. All of the above organisms lie in a plane parallel to the longer axis of the host cell and have been demonstrated only in longitudinal sections.

Organic mercury seed disinfectants, W. H. TISDALE and J. W. TAYLOR (*Abs. in Phytopathology, 13 (1923), No. 1, p. 38*).—Since 1920 several chemical compounds (liquid and dust) produced by American chemists, and Uspulun from Germany, have been tested by the Bureau of Plant Industry, U. S. D. A., along with formaldehyde, hot water, Bordeaux mixture, and copper carbonate, to determine their effect on germination, vigor, and smut control of the small grains.

The dusts (including copper carbonate) were less effective than were liquids in controlling barley and oat smuts. The most promising liquid treatments were Corona Compound No. 620, Chlorophol, Uspulun, and Semesan. All improved germination in greenhouse and field, increased field stands, and controlled smuts. Chlorophol gave the best yield of barley or oats. Copper carbonate proved best for wheat bunt. The mercury treatments appear promising for barley and oat smut control.

Strains of the leaf-rust of wheat, Puccinia triticina, in the United States, E. B. MAINS and H. S. JACKSON (*Abs. in Phytopathology, 13 (1923), No. 1, p. 36*).—Cultures of wheat leaf rust from various parts of the United States, sown on 200 wheat varieties, have shown that this rust is not uniform but that it consists of at least 12 strains differentiated by their action on 7 varieties, Malakof (C. I. No. 4898), Mediterranean (C. I. No. 5776), Democrat (C. I. No. 3384), and 4 unnamed spring wheats (C. I. Nos. 3756, 3778, 3779, and 3780), some of the cultures proving to be mixtures. Study of 18 single-spore cultures has added to these 7 wheat varieties 24 others as differential hosts, in the seedling stage under greenhouse conditions, to one or more strains of leaf rust.

These strains are divided into *Triticum aestivum*, winter 7, spring 5; *T. durum* 5; *T. dicoccum* 3; *T. spelta* 2; *T. monococcum* 1; and *T. polonicum* 1. No variety was immune, and no culture produced severe infection on all varieties. Though more or less mixture of rust strains appears in the field, different strains may dominate in separate sections. Such wheats as those of the Turkey type show high resistance in the field but considerable susceptibility in the greenhouse.

Wheat smut investigations in Kansas: Report of progress, 1920–21, C. O. JOHNSTON (*Abs. in Phytopathology, 13 (1923), No. 1, p. 36*).—Kanred shows resistance to *Tilletia tritici* under Kansas conditions, but no more resistance to *T. levis*, the species commonly found in Kansas, than do Turkey, Kharkof, and other hard winter wheats. Soft red winter wheats, as a group, seem more susceptible to *T. levis* than do the hard red winter varieties. The amount of smut increases with lateness of planting, from September 15 to November 1, after which the percentage of infection decreases rapidly. Experimental data indicate that under conditions in eastern Kansas spores of *T. levis*, falling on the soil during August, are not a factor in producing bunt infection. This is perhaps not true for western Kansas where summer fallowing is practiced and summer rainfall is less. Further investigations are being conducted in this connection.

Modified and simplified hot-water and vapor treatments for the control of loose smut in wheat, with special reference to seed injury, V. F. TAPKE (*Abs. in Phytopathology, 13 (1923), No. 1, p. 38*).—Experiments during two years by the Office of Cereal Investigations, U. S. D. A., on 11 lots of seed show yield reductions averaging 12 per cent following the modified hot water bath ordinarily prescribed for controlling loose smut. This is shown conclusively to be due to seed killing by the treatment in cases where the seed coat is broken over the embryo, practically all of which occurs in machine threshing. Very little killing is noted in case of uninjured seeds, but this condition requires careful threshing by hand.

A simplified hot water treatment has been devised which effectively controls loose smut of wheat reducing yields. A vapor treatment also has been employed successfully.

Control of stinking smut of wheat (Tilletia levis) with dust treatments, G. H. COONS (*Abs. in Phytopathology, 13 (1923), No. 1, p. 37*).—Tabulated results from tests of copper carbonate dust and copper sulfate with lime dust on heavily smutted winter wheat are presented in comparison with standard formaldehyde treatments for stinking smut control.

In view of the heavy smut production in the controls and the marked reduction produced by copper carbonate and copper sulfate and lime dusts, it is held that the use of these with fairly clean grain would give satisfactory control of stinking smut. Tests with oat smut control were not satisfactory.

Cytological studies on the infection of wheat seedlings by Tilletia tritici (Bjerk.) Wint., H. M. WOOLMAN (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 36, 37*).—Cytological studies conducted by the Office of Cereal Investigations, U. S. D. A., in cooperation with the Oregon Experiment Station, show that *T. tritici* enters the epidermis of the coleoptile of both susceptible and resistant wheat plants grown under conditions for maximum infection, but that in highly resistant varieties it develops no further. Inhibiting factors evidently are active in or just beneath the epidermis.

Recent studies on control methods of Texas root rot, J. J. TAUBENHAUS and D. T. KILLOUGH (*Abs. in Phytopathology, 13 (1923), No. 1, p. 33*).—It is found possible to control Texas root rot by deep fall plowing or crop rotation, provided clean culture is practiced not only during the growing season but

also during the fall and winter months. This is necessary on account of the fact that the causal organism overwinters on living roots of several susceptible hosts, particularly *Ipomoea trichocarpa*.

Spindling tuber or marginal leaf-roll, K. H. Fernow (*Abs. in Phytopathology, 13 (1923), No. 1, p. 40*).—The potato marginal leaf roll recognized as a disease in 1921 is described, the most characteristic symptom being the (often extreme) elongation of the tubers. There is no shortening of the stolons and no phloem necrosis, according to the results of examination by Artschwager. Yield is considerably reduced. The disease was transmitted by grafting. No progeny was grown. The disease has been observed in Rural, Green Mountain, and Cobbler.

Mosaic and leaf roll of the potato in the Northwest, G. K. K. Link (*Abs. in Phytopathology, 13 (1923), No. 1, p. 39*).—Potato mosaic is said to be present practically everywhere in the Northwest, occurring on the leading varieties, Idaho Rural (20 to 40 per cent) and Russet Burbank (10 to 20 per cent), the only stocks now remaining free (5 per cent or less) being those introduced early into sequestered localities. After a 3-year search aphids were first found in the potato fields in 1922, appearing abundantly during late August and September in those sections which are considered the best sources for seed.

Infectious leaf roll is plentiful over northeastern Washington, northern Idaho, and western Montana, affecting primarily Russet Burbank (15 to 20 per cent), and it is still on the increase, having spread considerably during 1919–1922.

Observations (1919–1922) indicate that under the prevalent western growing-season conditions of dryness, heat, and sunshine there occur such masking of mosaic and other virus disease symptoms and such changes in even healthy potato plants that methods of inspection and diagnosis which are valid elsewhere are inadequate in the West, and this is especially true under so-called dry-land conditions.

A new host for potato mosaic, K. H. Fernow (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 40, 41*).—Twelve plants of *Nicandra physaloides*, rubbed with crushed leaves of mosaic potato plants, all developed distinct mottling. No mosaic was developed by rubbing *N. physaloides* with leaves of mosaic tomato, mosaic tobacco, or mottled burdock. The Nicandra-to-Nicandra infection was again transmitted to sound Nicandra by inoculation. Under favorable conditions the infection shows within two weeks or less after inoculation. Mosaic *Physalis pubescens* was also used successfully as a source to inoculate a Nicandra plant. Attempts to transmit mosaic back to potato have not yet been successful, nor has the progeny of inoculated potato plants yet been grown.

Potato mosaic masking at high altitudes, H. G. MacMillan (*Abs. in Phytopathology, 13 (1923), No. 1, p. 39*).—It is believed that the large proportion of the shorter wave lengths present in the sunlight at high altitudes is a factor which operates to stimulate chlorophyll production to the point of masking more or less the common symptoms of mosaic as observed in such localities, though some antiseptic action is admittedly possible. Mosaic plants live longer at such high altitudes. Nonmottled mosaic plants readily develop mottling if transferred to lower altitudes.

Spindling-tuber and other degeneration diseases of Irish potatoes, E. S. Schultz and D. Folsom (*Abs. in Phytopathology, 13 (1923), No. 1, p. 40*).—Spindling-tuber disease of potato, as here described, has been carried to sound material by means of tuber and vine grafts, leaf inoculation, and aphids. Leading commercial potato varieties show all incidence percentages of this disease, which spreads about as rapidly as does mosaic, infecting wholly or in

part given potato hills and even tubers, with resulting progeny and reducing yield. Aphids transmit spindle tuber, curly dwarf, leaf roll, and mosaic (in mild, severe, and leaf-rolling form). Leaf-roll mosaic forms a curly dwarf when in combination with spindling tuber. Severe mosaic is more injurious and infectious, causing current season symptoms oftener and sooner than does mild mosaic or leaf-rolling mosaic. Combinations of these diseases may reduce tuber production to the point of effecting self-elimination. Transmission to healthy plants decreases as the distance from diseased plants increases, and fluctuates seasonally and regionally with aphid infestation.

The transmission of sugar-cane mosaic by Aphis maidis under field conditions in Porto Rico, C. E. Chardon and R. A. Veve (*Phytopathology, 13 (1923), No. 1, pp. 24–29, fig. 1*).—In a previous publication (E. S. R., 43, p. 547) Brandes gave an account of greenhouse experiments which indicated that the corn aphis (*A. maidis*) was capable of transmitting the mosaic disease to sugar cane, but stated that the insects responsible for field transmission remained to be determined.

The authors report the common occurrence of *A. maidis* on wild grasses in cane fields in Porto Rico, and that after the fields are weeded the aphid passes to the sugar cane plant where it lives for a time in the central whorl of leaves. During the short time that it stays on cane, *A. maidis* transmits the infective substance of the sugar cane mosaic and carries the disease from diseased to healthy plants.

Mosaic disease of sweet potato, G. F. Weber (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 42, 43*).—Recent observation and experimentation show a condition of sweet potato similar in many ways to mosaic in other plants. In the 10-acre field where the disease first appeared 6 per cent of the plants were affected, the yield being reduced to less than 10 per cent of the normal. The symptoms are described. Twenty healthy plants inoculated variously with juices from 12 diseased plants developed no symptoms of the disease.

Germination of the spores of timothy smut (Ustilago striaeformis (Westd.) Niessl), W. H. Davis (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 38, 39*).—The author has shown that spores of this smut (*U. striaeformis*) parasitizing timothy (*Phleum pratense*), June grass (*Poa pratensis*), redtop (*Agrostis palustris*), and orchard grass (*Dactylis glomerata*) will germinate when properly afterripened, and he summarizes the results of biweekly germination tests continued for two years.

Similar conditions for each host favor the success of smut spores. The smut spore afterripening period varies in length from 180 to 265 days and the germinability period from 53 to 210 days, with an average of 70 days. As to germination temperatures the minimum was 10°, the maximum 35°, and the optimum 22° C. Media had no apparent forcing value. Afterripened spores germinate upon or beneath the surface of distilled water, but not on damp surfaces. The fully developed promycelium may be septate and bear one branch from each cell. A few promycelia bore typical sporidia at each cross wall. Spore germinations show this fungus to be a Ustilago and not a Tilletia.

Time of apple blotch infection for 1922 in southern Pennsylvania, R. C. Walton and C. R. Orton (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 43, 44*).—Bagging experiments on unsprayed Smith Cider apple trees in Adams County, Pa., show that infection by *Phyllosticta solitaria* started very early in the spring of 1922, initial infection occurring prior to May 23, probably not later than May 16, 10 days after petal fall, and at least 10 days prior to the time usually recommended for applying the first spray.

Aerial galls of peach, J. A. McClintock (*Abs. in Phytopathology, 13 (1923), No. 1, p. 45*).—A peach orchard was planted in the fall of 1920 on land cleared

of oak in 1916, but still joined on three sides by standing oak timber, some showing large galls. The peach seedlings were budded June 25–30, 1921, and 10 days later topped at the bud. About 4,000 trees out of 80,000 developed galls at the topping wounds, but none on the roots. After similar work in 1921–1922, only three galls were found. The growing season of 1922 was dry, and that of 1921 was wet. Cultural studies of the peach galls were projected.

The importance of the Phoma stage of Mycosphaerella rubina causing spur blight of raspberries, A. G. NEWHALL (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 44, 45*).—This Phoma stage plays an important rôle by initiating secondary cycles throughout the remainder of the growing season. The connection between the perithecial and the pycnidial stage of *M. rubina* has repeatedly been demonstrated in single-spore cultures on Melilotus stems. Furthermore, suspensions of ascospores inoculated into young raspberry canes likewise gave characteristic lesions in which the Phoma stage developed.

Melanose and stem-end rot of citrus fruits, O. F. BURGER (*Abs. in Phytopathology, 13 (1923), No. 1, p. 45*).—*Phomopsis citri*, washed down in the spring from dead wood, causes melanose on citrus fruit and leaves. Leaves four weeks old are immune. The grapefruits were found to become immune about the middle of May, but they are again attacked when ripening, with a resulting decay known as stem-end rot. This occurs always after the abscission layer is formed, this layer appearing as a natural opening for the fungus to enter. It can not penetrate the rind, though it causes rot on being used to inoculate.

Data incompletely collected at the time of the report indicate that melanose was controlled by a 3–3–50 Bordeaux spray, with 1 per cent oil emulsion, applied beginning in March and April, 1922, and continuing from 10 to 20 days after the blossoms dropped.

The relation of an undescribed species of Pestalozzia to a disease of Cinnamomum camphora, N. O. HOWARD (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 47, 48*).—Recent investigations to determine the mode of causation of a threatening disease of *C. camphora* associated with the activity of a thrips (*Cryptothrips floridensis*) and with the constant presence of a fungus (*Pestalozzia* sp.) showed that the thrips is at least partly responsible for the dissemination of the Pestalozzia spores. Greenhouse experiments, however, upon thrips-free plants indicate that this Pestalozzia can develop in dead tissue but can not attack healthy tissue without the aid of the thrips. This fungus is regarded as a saprophyte or at most as a weak wound parasite on *Cinnamomum camphora*, its control requiring as a condition the elimination of *Cryptothrips floridensis*.

The Melanconis disease of the butternut, A. H. GRAVES (*Abs. in Phytopathology, 13 (1923), No. 1, p. 47*).—This butternut fungus (*M. juglandis*) has been known in its conidial stage as *Melanconium oblongum*. Its ascospore stage, hitherto known as *Diaporthe juglandis*, has now been definitely proved by culture work to be the perfect stage of *M. oblongum*. The fungus has now been proved to be a weak wound parasite, working faster if the tree is already weakened, but ordinarily so slowly that no rapid wilting or blighting effects are shown. Diseased parts should be pruned away some distance below the apparent lesion, and the wounds should be covered. No remedy is practicable after the trunk has been penetrated.

A noteworthy case of resistance to the chestnut bark disease, J. F. COLLINS (*Abs. in Phytopathology, 13 (1923), No. 1, p. 47*).—Records and photographs are discussed as made of a sprout of an American chestnut tree which in 1912 at the size of 1.2 in. in diameter was badly diseased in several places,

appearing to be girdled near the base by the chestnut blight fungus. The tree survived the attack and had grown to a diameter of 7 in. by 1922, having shown but little evidence externally of the disease in 1917 and thereafter.

Studies on the aecial stages of Cronartium ribicola and Cronartium occidentale, R. H. Colley and M .W. Taylor (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 46, 47*).—Morphological differences in spore markings and margins between *C. ribicola* and *C. occidentale* are slight but consistent. Other differences described and statistically analyzed are such that the two species can be readily separated on a basis of morphological and dimensional differences.

White-pine blister rust infection through grafted roots, M. W. Taylor (*Abs. in Phytopathology, 13 (1923), No. 1, p. 46*).—Evidence is adduced supporting the theory that infection with *Cronartium ribicola* may spread by means of grafted roots from diseased to healthy trees.

White pine blister rust in the Northwest, H. Metcalf (*Abs. in Phytopathology, 13 (1923), No. 1, p. 46*).—The oldest white pine blister rust infection (1910) found at Vancouver, B. C., indicates this as the point of first infection of this disease, though earlier importations appear possible. The disease now extends north (on pines and Ribes) to the limits of *Pinus monticola*, east (on pines and Ribes) to Beaton, B. C., and south (on Ribes) to within 25 miles of the Columbia River at the coast. The heaviest spread has been northward, serious local damage to *P. monticola* having already occurred. This host appears to be somewhat more susceptible than *P. strobus*.

Foreign studies of white pine blister rust, P. Spaulding (*Abs. in Phytopathology, 13 (1923), No. 1, p. 45*).—Studies in Europe during eight months are noted. *Cronartium ribicola* is said to have been noted as attacking *Pinus koraiensis*, *P. strobiformis*, *P. albicaulis*, and possibly *P. balfouriana*, this enumeration leaving but one or two species of five-leaved pines not now known to be attacked. Apparently the fungus can kill even the largest and oldest trees. This is done by girdling the trunk in the lower part of the crown.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A general textbook of entomology, A. D. Imms (*London: Methuen & Co. Ltd., 1925, pp. XII+698, figs. 607*).—Part 1 of this textbook (pp. 1–156) deals with the anatomy and physiology of insects, part 2 (pp. 157–198) with the development and metamorphosis, and part 3 (pp. 199–667) with the orders of insects. Author and subject indexes are included.

Danish forest zoology, J. E. V. Boas (*Dansk Forstzoologi. Copenhagen: Glydendalske Boghandel, 1923, 2. ed., enl., pp. XXII+761, pls. 32, figs. 638*).—The first part of this work, the first edition of which was issued in 1898, deals with the mammals important in forestry (pp. 1–126), the second with the fowls (pp. 127–185), the third with insects (pp. 187–700), and the fourth part with acarids, *Limnoria* spp., *Teredo navalis*, and Lumbricus (pp. 701–739).

Birds of an Indian garden, T. B. Fletcher and C. M. Inglis (*Calcutta: Thacker, Spink & Co., 1924, pp. VIII+161, pls. 32, figs. 39*).—This consists of a collection of popular accounts of 30 common birds, accompanied by colored plates, which first appeared as a series of papers in the *Agricultural Journal of India* during the years 1919–1924 under the title Some Common Indian Birds.

British waders, E. C. Arnold (*Cambridge: Univ. Press, 1924, pp. VII+102, pls. 51*).—This is a popular account of this group of British fowl.

Tularemia, E. Francis (*Jour. Amer. Med. Assoc., 84 (1925), No. 17, pp. 1243–1250, figs. 3*).—This is a further account of the bacterial disease of rodents

caused by *Bacterium tularense*, and transmitted by bloodsucking insects (E. S. R., 49, p. 784).

Notes on Lepidoptera and Hymenoptera, F. M. Schott (*Jour. N. Y. Ent. Soc., 33 (1925), No. 1, pp. 53–56*).—*Hemerophila pariana* Clerck, a European moth first reported from this country by Felt in New York in 1917 (E. S. R., 38, p. 60) and investigated by Porter and Garman in Connecticut (E. S. R., 49, p. 556), is said to be well established in northeastern New Jersey. The chalcidoid parasite *Dibrachys boucheanus* Ratz. was reared from its cocoons, as was the ichneumonid *Epiurus indagator* Cress., and five other hymenopterous species also appeared. The author suggests that the name flit moth or apple flit moth, from the manner of its holding its wings when resting, is preferable to the name apple and thorn skeletonizer.

The leaf-rolling species *Tortrix pallorana* Rob. is reported to have done considerable damage to rose foliage at Murray Hill, N. J., in July, its work resembling that of the common rose leaf-tyer. The ophionid parasite *Campoplex ferrugineipes* Ashm., was reared from larvae collected. The tortricid *Olethreutes hebesana* Wlk. was found infesting the terminal shoots of the false dragonhead (*Physostegia* sp.), causing a withering and blackening of the foliage. The galleries of *O. hemidesma* Zell. were abundant on spiraea in the vicinity of Rutherford in August, from which an ichneumonid species of the genus Epiurus was reared.

Insects affecting stems of wheat and other small grains in North Dakota, R. L. Webster (*North Dakota Sta. Circ. 25 (1925), pp. 3–20, figs. 22*).—The insects here discussed include the wheat stem maggot, frit flies (*Oscinis frit* L.), the western wheat stem sawfly (*Cephus cinctus* Nor.), stalk borer, and the Hessian fly.

[**Contributions on economic insects**] (*Ztschr. Angew. Ent., 10 (1924), No. 2, pp. IV+273–499, figs. 63*).—The papers here presented (E. S. R., 52, p. 554), which relate to insects of economic importance, include the following: The Pierid *Aporia crataegi* L., which includes a bibliography of 83 titles, by F. Stellwaag (pp. 273–312); Data on the Life History of the Forleule or Pine Moth, by K. Eckstein (pp. 313–326); The Repression of the More Important Forest Insects by Palearctic Birds: Biozonalogical Studies, II, III, by A. von Vietinghoff von Riesch (pp. 327–352): The Oviposition of Trioxys Hal., together with Observations on the Economic Importance of These Parasites of Aphidids, by H. Eidmann (pp. 353–363); Biological Notes on the Coccidae (pp. 364–386) and A New Coccid on Spruce, *Pseudococcus tirolensis* (pp. 387–389), both by M. Dingler; Southern Scale Insects in the Rhine Valley, by H. Wünn (pp. 390–397); The Sweet-potato Weevil in Java and Neighboring East Indian Islands, by N. A. Kemner (pp. 398–435); Culicid Observations in 1922 and 1923, by E. Martini (pp. 436–447); and The Thickening of Nectars by the Honeybee, by K. Brünnich (pp. 448–457).

Among the short contributions presented are the following: On the Oviposition of Ephialtes, by W. Baer (pp. 458–460): An Enemy of the Woolly Apple Aphid, [*Aphelinus mali* Hald.], by J. Bolle (pp. 463–465); The Necessity for Including Temperatures in Bionomic Contributions, by E. Martini (pp. 466–468); A Peculiar Case of Association of Coccids, by M. Dingler (pp. 468, 469); An Extensive Outbreak of *Ptinus fur* L., by H. W. Frickhinger (pp. 469, 470); Notes on the Boll Weevil, by A. Andres (pp. 470–472); Eulan M. (pp. 472–476) and The Granary Weevil and the Apple Blossom Weevil [*Anthonomus pomorum* L.] (p. 476), both by H. von Lengerken.

Report of the entomologist [of Hawaii], D. T. Fullaway (*Hawaii Bd. Commrs. Agr. and Forestry [Bien.] Rpt., 1923–24, pp. 29–35, pls. 3*).—It is reported that one of the parasites of the army worm, the small chalcid Euplec-

trus platyhypenae, has been successfully reared in confinement and thousands of individuals liberated in different localities on the islands. It appears to be an effective enemy, it now being difficult to find army worms at Honokaa that are not parasitized by this species.

The control of the avocado mealybug *Pseudococcus nipae*, officially known as the coconut mealybug, through enemies of the species collected in Mexico and now established on Oahu, Hawaii, Maui, and possibly other islands, was the outstanding achievement of the period under report. The enemies include *Pseudaphycus utilis*, an internal encyrtid parasite, and the coccinellid beetles *Hyperaspis silvestri* and *Curinus coeruleus*.

Two chalcid fly and two lady beetle enemies of the pineapple mealybug (*Pseudococcus bromeliae*) were introduced from Mexico, the former with only partial success. The lady beetles, however, proved easy to multiply and their ultimate establishment seems assured. Miscellaneous introductions of parasites and predators are briefly considered. A colored plate showing the several enemies of the pineapple mealybug from Panama is included.

Records of introduction of beneficial insects into the Hawaiian Islands, O. H. SWEZEY (*Hawaii. Ent. Soc. Proc., 5 (1923), No. 2, pp. 299–304*).—A classified list arranged chronologically.

Cold process oil emulsion, W. W. YOTHERS (*Citrus Indus., 6 (1925), No. 3, p. 26*).—The author presents several formulas for cold process emulsions.

Notes on the mealy-bugs of economic importance in Hawaii, D. T. FULLAWAY (*Hawaii. Ent. Soc. Proc., 5 (1923), No. 2, pp. 305–321, figs. 3*).—This is a report of studies of the common dactylopiine species occurring in Hawaii.

The Japanese camphor scale, H. L. DOZIER (*Ala. Polytech. Inst. Ext. Circ. 75 (1924), pp. 15, figs. 15*).—This is a practical summary of information on *Pseudaonidia duplex* Ckll.

Four new species of Coccidae from Egypt, W. J. HALL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 46 (1924), pp. [3]+8, pls. 6*).—The species described are *Margarodes hirsutissimus* from *Imperata cylindrica*, *Pseudococcus variabilis* from *Panicum* sp. and sugar cane, *Trionymus polyporus* from millet, and *Lepidosaphes intermittens* from *I. cylindrica* and *Pennisetum dichotomum*.

A study of the cause of the decrease in the infestation of the European corn borer (Pyrausta nubilalis Hubn.) in the New England area during 1923, G. W. BARBER (*Ecology, 6 (1925), No. 1, pp. 39–47, figs. 2*).—This is a report of investigations, by the U. S. D. A. Bureau of Entomolgy, which have led to the conclusion that the subnormal temperatures which prevailed during the oviposition season in the late summer of 1923 played an important part in the decrease of numbers of the European corn borer in New England. The probable longer periods of life of the adults caused by low temperatures served to spread oviposition over a relatively longer period, which was favorable for the development of the egg parasite *Trichogramma minutum* Ril., and the relatively fewer eggs deposited by female moths probably served to increase the importance of the parasite.

The oriental peach moth, A. PETERSON (*Ill. State Hort. Soc. Trans., 58 (1924), pp. 183–188*).—This address is based upon investigations in New Jersey, previously noted (E. S. R., 51, pp. 457, 760).

Researches on the applied biology of the potato-tuber worm and its parasites and general considerations on the utilization of entomophagous insects in agriculture [trans. title], B. TROUVELOT (*Min. Agr. [France], Ann. Epiphyties, 10 (1924), Nos. 1, pp. 82, figs. 28; 2, pp. 83–132, pls. 4, figs. 8*).—This is a contribution from the entomological station at Paris. Part 1 of the account (pp. 6–24) deals with the potato-tuber worm in France and its economic importance, part 2 (pp. 25–35) with cultural control methods, and part 3

(pp. 36–99) with control by means of entomophagous insects, including a study of the biology of *Habrobracon johannseni* Vier. and its utilization in France, with the technique of acclimation (pp. 42–99). Part 4 (pp. 100–120) consists of general remarks on acclimation of introduced entomophagous insects. A bibliography of 38 titles is included.

The Erythrina twig-borer (Terastia meticulosalis) in Hawaii (Pyralidae, Lepidoptera), O. H. SWEZEY (*Hawaii. Ent. Soc. Proc., 5 (1923), No. 2, pp. 297, 298*).—A brief account of this pyralid moth, which the author reared from pupae found in pods of the wiliwili tree (*E. monosperma*), in Makaleha Valley, Oahu, it being the first record of its occurrence in Hawaii.

The Mediterranean fruit-fly in Palestine [trans. title], F. S. BODENHEIMER (*Zionist Organ. Inst. Agr.* [*etc.*] *Agr. Expt. Sta. Ext. Circ. 2 (1925), pp. 22, pl. 1, figs. 11*).—There is a general account of *Ceratitis capitata* Wied., which is a common pest in Palestine, where oranges, apricots, and peaches are the fruits most frequently attacked. Hosts of minor economic importance include apples, prickly pears, figs, bananas, guavas, etc. The importance of the latter fruits lies in the fact that they afford opportunities to the fly to reproduce throughout the year. In the coastal plain (Sarona), there are 7 generations during the year with a winter interval of 120 days, in the mountains (Jerusalem) 5 generations with a winter interval of 206 days, and in the Ghor the possibility of 10 generations with 110 days interruption during the winter.

Oranges are severely attacked twice, once in November, the second time in March. A lesser attack takes place in September. Apricots and peaches are attacked in 3 or 4 generations from May till August or September.

A bibliography of 19 titles is included.

Descriptions of lantana gall-fly and lantana seed-fly (Diptera), J. M. ALDRICH (*Hawaii. Ent. Soc. Proc., 5 (1923), No. 2, pp. 261–263*).—A gallfly reared from lantana in the Hawaiian Islands and said to have been imported from Mexico is described as new under the name *Eutreta xanthochaeta*. The lantana seed-fly, *Agromyza lantanae* Frogg. (E. S. R., 42, p. 158), was reared from seeds of lantana in the Hawaiian Islands.

The gout fly of barley, A. D. IMMS (*Jour. Min. Agr.* [*Gt. Brit.*], *31 (1925), No. 12, pp. 1137–1140, pls. 2, fig. 1*).—This is a brief summary of information on *Chlorops taeniopus* Meig., an important pest of barley in many parts of Great Britain, which, it is concluded, can be largely controlled by preventive measures.

The olive fly (Dacus oleae Rossi) in Palestine [trans. title], F. S. BODENHEIMER (*Zionist Organ. Inst. Agr.* [*etc.*] *Agr. Expt. Sta. Ext. Circ. 6 (1925), pp. 16, figs. 12*).—This is an account of *D. oleae*, a common pest in all parts of Palestine, where, together with the leopard moth, it is responsible for the poor olive crops. There are six generations in the coast plain and five in the mountains of Palestine. Up to the present time *Opius concolor* Szepl. and *Eupelmus* sp. (probably *E. urozonus* Dalm.) have been reared from it, but the biological method of control does not seem to be very promising. A bibliography of eight titles is included.

Results obtained in the transmission of dengue fever, J. F. SILER, M. W. HALL, and A. P. HITCHENS (*Jour. Amer. Med. Assoc., 84 (1925), No. 16, pp. 1163–1172, figs. 3*).—This is a report of investigations conducted by members of the U. S. Army Medical Department Research Board in Manila, P. I., from July, 1924, to January, 1925, inclusive. In the course of this work, during which 42 American soldiers volunteered and were subjected to 83 biting experiments with potentially infected *Culex quinquefasciatus* (*C. fatigans*) and the yellow-fever (*Aedes egypti*) mosquitoes, dengue fever was transmitted by bites of the latter in 25 of the 42 volunteers, or 60 per cent.

The work is considered to justify the conclusion that a patient with dengue fever is capable of infecting the yellow-fever mosquito, at least during the first 3 days of the disease. The results indicate that the virus causing dengue fever must remain in the mosquitoes for a period of approximately 11 days before they become capable of transmitting the disease to nonimmune human beings. It is quite definitely demonstrated that *A. egypti* mosquitoes infected with dengue-fever virus continue to be infective for very long periods of time and probably throughout the remainder of their lives. It is concluded that *C. quinquefasciatus* is not a transmitter of dengue fever. As regards immunity from the disease, it is reported that 12 persons who had recovered from dengue which began between 41 and 121 days previously were reinfected through the injection into them of blood from patients in the early stages of the disease, that 58 per cent of the patients were immune, and that those who did develop the typical disease were sick a shorter period of time, 2.8 days as compared with 4.8 days in their primary attack.

The Dendroctonus problems, F. C. Craighead (*Jour. Forestry, 23 (1925), No. 4, pp. 340–354*).—This general discussion deals particularly with the western pine beetle, Black Hills beetle, mountain pine beetle, and southern pine beetle.

Anatomy and physiology of the honeybee, R. E. Snodgrass (*New York and London: McGraw-Hill Book Co., Inc., 1925, pp. XV+327, figs. 108; rev. in Bee World, 6 (1925), No. 12, p. 189*).—This work, which commenced as a revision of The Anatomy of the Honey Bee (E. S. R., 23, p. 365), deals with the subject under the following headings: General external structure (pp. 1–10); the head and its appendages (pp. 11–63); the thorax and its appendages (pp. 64–107); the abdomen, its glands, and the sting (pp. 108–130); the muscles (pp. 131–146); the alimentary canal and its glands (pp. 147–177); the circulatory system (pp. 178–190); the respiratory system (pp. 191–207); the fat body and the oenocytes (pp. 208–223); the nervous system and the eyes (pp. 224–246); the reproductive system (pp. 247–264); development—from germ cells to larva (pp. 265–295); and metamorphosis—from larva to adult (pp. 296–306). A bibliography of text references (pp. 307–313) is included.

The differentiation of sex in the bee, I, II, C. S. R. Fergusson (*Bee World, 6 (1924), Nos. 4, pp. 56, 57; 5, pp. 74, 75*).—This is a second series of articles, in continuation of that previously noted (E. S. R., 51, p. 60).

American foulbrood of bees, D. H. Jones (*Sci. Agr., 5 (1925), No. 6, pp. 190–195*).—This is a report of experiments with various disinfectants on infected combs, conducted at the Ontario Agricultural College.

Tests of Izal, a coal-tar product with a phenol coefficient of 18 to 20, show that it is not effective in killing spores of *Bacillus larvae* as they occur in larval scales of infected combs, even after 18 days' immersion at room temperature. Chlorazene, Dakin's new antiseptic and surgical disinfectant, with a phenol coefficient of 50+, in a 1 per cent solution in water was not effective in 48 hours' immersion, and the same was true of Be-Health, a hypochlorite, said to be prepared particularly for foulbrood of bees. A mixture of 20 per cent formalin in alcohol, known commercially as Hutzelman's solution, killed spores of *B. larvae* in uncapped cells in 24 hours' immersion and in capped cells in 48 hours' immersion. The water dilutions of formalin proved to be as effective as the alcohol solutions in destroying the spores of *B. larvae* as they occur in the scales of infected brood combs.

Recent amendments to the crop pest law (*Va. State Crop Pest Comm. Quart. Bul., 6 (1924), No. 2, pp. 4*).—Amendments to the apiary inspection law are included.

The cultured citrus ant of south China, G. W. Groff and C. W. Howard (*Lingnaam Agr. Rev., 2 (1925), No. 2, pp. 108–114, pls. 3*).—This is an account of *Oecophylla smaragdina* Fab., the red tree ant of the Old World Tropics, which Chinese citrus growers in Szewui and other fruit-producing districts of Kwangtung commonly rear in their orchards. The growers insist that when they have strong colonies in their trees they are never troubled by *Tesseratoma papillosa*, a pentatomid which is very injurious to litchi and citrus fruits.

A preliminary list of the ants recorded from China, N. G. Gee (*Lingnaam Agr. Rev., 2 (1925), No. 2, pp. 100–107*).—One hundred and twenty-three forms are listed as occurring in China. A list of 32 references to the literature is appended.

The wasp Nysson hoplisivora, a parasitic relative of Hoplisus costalis, E. G. Reinhard (*Jour. Wash. Acad. Sci., 15 (1925), No. 8, pp. 172–177*).—An account is given of studies of the sphecoid wasp *N.* (*Brachystegus*) *hoplisivora*, which deposits its egg in the nest chamber of *H.* (*Gorytes*) *costalis*, another sphecoid, which preys upon various species of Membracidae (Ceresa, Platycotis), storing them away as food for its young in burrows dug in the sandy earth. It appears that the Nysson larva, hatching out before the egg of the host, attacks the tree hopper upon which it is deposited. It soon leaves the tree hopper and, upon exploring the cell, discovers and destroys the host's egg by feeding upon it.

The biology of an ichneumonid, Dicaelotus erythrostoma Wesm. [trans. title], P. Voukassovitch (*Bul. Biol. France et Belg., 58 (1924), No. 4, pp. 495–499, figs. 2*).—This is a report of the study of a parasite of the eudemis moth, *Polychrosis botrana* Schiff.

Five braconid parasites of the genus Heterospilus, S. A. Rohwer (*Jour. Wash. Acad. Sci., 15 (1925), No. 8, pp. 177–182, fig. 1*).—The parasites here described as new are *H. beameri*, reared from eggs of Cicada in Kansas; *H. cephi*, a parasite of *Cephus pygmaeus* at Ithaca, N. Y.; *H. etiellae*, reared from larvae of *Etiella zinckenella* Treit. in Porto Rico; *H. zeteki*, taken from the nest of *Nasutitermes ephratae* Holmg. in the Canal Zone; and *H. melanocephalus*, thought to be a parasite of *Melitaria junctolineella* and *Cornifrons elautalis* at Uvalde, Tex.

Investigations of Tetrastichus rapo Wlk. (Hym. Chalcididae) [trans. title], C. Gautier and S. Bonnamour (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 246–253*).—This is a report of studies of a hyperparasite of *Anilastus ebeninus* Grav. and *Apanteles glomeratus* L.

The adult of our common North American chigger, H. E. Ewing (*Biol. Soc. Wash. Proc., 38 (1925), pp. 17–19, fig. 1*).—The author has reared the common North American chigger, *Trombicula irritans* (Riley)=*T. tlalzahuatl* (Murray), from *T. cinnabaris* Ew., thus confirming the view previously expressed (E. S. R., 50, p. 762). The adult is a scavenger which lives in nature largely on fecal matter and decaying woody substances.

A contribution to our knowledge of the taxonomy of chiggers, H. E. Ewing (*Amer. Jour. Trop. Med., 5 (1925), No. 3, pp. 251–265, figs. 4*).—The author presents evidence to show that there is only one common chigger species attacking man in the whole central and southern part of the United States, and that the species described by Riley as *irritans* has priority over *Trombicula tlalzahuatl* (Murray), as noted above. The paper includes descriptions of the new genus Hoplothrombium, six new species, and a new variety.

The native host of the chigger, A. E. Miller (*Science, 61 (1925), No. 1578, pp. 345, 346*).—The author reports collection in 1924 of the chigger mite, in

Ohio, namely, large and small specimens of the black snake (*Zamenis constrictor*), the garter snake (*Eutoenia sirtalis*), common hognose snake (*Heterodon platyrhinus*), black hognose snake (*H. platyrhinus niger*), and the eastern ring-necked snake (*Diadophis punctatus*). Through late September larvae which have been replete for several weeks begin to fall from the host and make their way into the loose soil to a depth of from 0.5 to 1 in. From two to three weeks are spent in a quiescent, or pupal, stage, after which the adults emerge but apparently remain within their earthen cells until the following spring. As usual with trombidiids, oviposition does not take place until spring, and there is but one generation a year. Some adults have been reared under very dry conditions, while others from the same host have reached maturity under quite moist surroundings. Investigations of this mite by Ewing have been noted (E. S. R., 39, p. 265; 46, p. 255; 50, p. 762).

The black sand mite (Penthaleus destructor Tkr.), R. W. E. TUCKER (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 3, pp. 269, 270*).—This is an account of an important enemy of vegetables and flowers in South Africa.

The spinose ear-tick (Ornithodorus megnini Dugès), G. A. H. BEDFORD (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 2, pp. 147–153, figs. 2*).—This is a summary of information on a tick first observed in Cape Colony in 1898, which during the last few years has become extremely common and is now widely distributed throughout the Cape Province, Orange Free State, and Bechuanaland, and also occurs in Natal and the Transvaal. See also a previous note (E. S. R., 40, p. 656).

FOODS—HUMAN NUTRITION

The twenty-ninth report on food products and the seventeenth report on drug products for 1924, E. M. BAILEY (*Connecticut State Sta. Bul. 267 (1925), pp. 421–491*).—Included in this annual report (E. S. R., 51, p. 859) are proximate analyses of various cacao products; diabetic, special, and miscellaneous foods; graham and whole wheat flours; buttermilk and human milk; and detailed analyses of 28 commercial brands of vanilla extract and 12 of tea.

Moulds on frozen meats, F. T. BROOKS (*Jour. Soc. Chem. Indus., 43 (1924), No. 40, p. 306T*).—In reply to the paper of Wright (E. S. R., 51, p. 365) in which the conclusion was drawn that black spot of cold storage meat may be due to other molds than *Cladosporium herbarum*, the author states that he has repeated two of the experiments reported by Wright, the inoculation of meat with spores of *Mucor mucedo* and with species of Penicillium, with no development of black spot in either case. He reiterates his earlier statement (E. S. R., 46, p. 860) that *C. herbarum* is the sole cause of black spot.

Amino acids in nutrition.—IX, The rôle of alanine and indol in the synthesis of tryptophane by the animal organism, B. SURE (*Amer. Jour. Physiol., 72 (1925), No. 2, pp. 260–263, figs. 6*).—In continuation of the series previously noted (E. S. R., 51, p. 862), evidence is presented from feeding experiments on rats that tryptophane is the primary growth-limiting factor in the proteins of corn and that this amino acid can not be synthesized in the body from alanine and indole.

Physiological regulation of the acid-base balance of the blood and some related functions, Y. HENDERSON (*Physiol. Rev., 5 (1925), No. 2, pp. 131–160, fig. 1*).—In this review the author discusses the present theories concerning the regulation of the acid-base balance of the blood, and suggests a new theory involving as one of the principal factors the oxidation of sugar in the tissues.

"When the blood alkali is decreased in such conditions as diabetic acidosis, or as a result of carbon monoxide asphyxia, or general anesthesia (e. g., with

ether), or after vigorous muscular exercise, the chief process involved is the withdrawal of alkali from the blood into the tissues, for the amount of (neutralized acid found in the blood is usually slight in comparison to the decrease of the alkali of the corpuscles and plasma bicarbonate. The condition chiefly determining the extent of this withdrawal of alkali, or its return to the blood, is the freedom with which sugar is oxidized in the tissues. Among the essential factors are an adequate supply of sugar, an ample supply of oxygen, and sufficient insulin to facilitate the process. Deficiency in any of these factors leads to withdrawal of alkali from the blood into the tissues. In the dynamic equilibrium of this process the mass action of oxygen is balanced against the mass action of bicarbonate ions, and the H-ions concentration is a variable dependent (through respiration) upon tthe ratio of oxygen to bicarbonate and tending to restore that ratio to normal by the shift of alkali from blood to tissues and vice versa."

A bibliography of 54 titles is appended.

Some effects of high environmental temperatures on the organism, F. B. Flinn (*Pub. Health Rpts.* [*U. S.*] *40* (*1925*), *No. 18, pp. 868–896, fig. 1*).—Changes in the body temperature and in the composition of the blood as a result of exposure to high environment temperatures were studied in short-haired mongrel dogs exposed from 1 to 6 hours to temperatures of 20, 30, 40, 45, and 50° C. with and without increased air movement and free drinking of water.

During the exposure at the lower temperature the behavior of the dogs was normal, at temperatures of 45 and 50° they became restless during the first part of the experiment and later were affected with drowsiness verging on coma. With increased circulation of air at the temperature of 50° the period of restlessness did not appear, but the animals showed great fatigue. With increased air movement and plenty of water to drink, the dogs after a short period of restlessness remained in good condition throughout the experimental period.

During the exposure for 6 hours to a temperature of 20 or 30° there was a drop in body temperature, while at 40° there was an increase of 1° and at 45 and 50° the body temperature rose very rapidly.

The oxygen capacity of the blood showed no changes during the various exposures beyond that attributed to the diurnal changes in the hemoglobin or the concentration of blood resulting from excessive evaporation of water. The oxygen content of the blood was unchanged at 20°, decreased at 30°, and increased slightly at 45 and 50°. The decrease is attributed to the low rate of metabolism at the higher temperature and the increase to increased aeration of the blood at still higher temperature.

The alkali reserve remained unchanged at 20 and 30°, decreased rapidly during the first 4 hours at 40° and more slowly during the next 2 hours, and decreased rapidly throughout the whole period at 45 and 50°. Similar changes were noted in the carbon dioxide content except that at 30° there was a slight rise.

The H-ion concentration of the plasma remained unchanged up to 45 and 50°, at which temperatures there was a decrease due to excessive pulmonary ventilation.

The concentration of blood sugar was decreased at 20 and 30° and for the first 2 hours at 40°, after which there was a tendency to increase. At 45° there was no change during an hour's exposure, but at 50° there was a sharp rise. The blood solids showed only the expected diurnal changes at 20 and 30° and an increase at the higher temperatures.

These results are thought to indicate that the body has no power of readjusting its general metabolism on a plane of higher body temperature. Increased air movement is temporarily beneficial, but the greatest benefit in maintaining the organism in a normal condition during exposure to high temperatures is thought to be the free drinking of water.

A list of 54 references to the literature is appended.

Sex differences in the requirements of certain food factors.—I, During growth, G. A. HARTWELL (*Brit. Jour. Expt. Biol., 2 (1925), No. 3, pp. 323–330, figs. 2*).—The data reported by the author in previous studies (E. S. R., 48, p. 861; 51, p. 567) have been analyzed with respect to the relative growth of male and female rats on various diets. Composite curves are given, indicating that the growing male requires more vitamin B than the growing female and is also more susceptible to the quality of the protein in the diet.

Dry milk for school service, G. C. SUPPLEE, O. D. DOW, and S. C. HOLLIS (*Nation's Health, 7 (1925), No. 4, pp. 254–256, figs. 4*).—The feasibility of using dry milk as a supplementary school lunch for undernourished children is indicated by the results obtained with it in a group of over 100 children of the first four grades of a village school in northern New York. The experiment consisted of a preliminary observation period of 3 months, during which time the children were weighed weekly, but no attempt was made to change their food habits, and a main period of the same length, during which dry milk containing 12 per cent fat and reconstituted within an hour before serving was given the children at 10 a. m. on each school day. The weighings were continued and records were made of the milk consumed. No attempt was made to alter the home food habits. Physical examinations were made of all the children at the beginning and end of the preliminary, and the end of the main period.

At the beginning of the experiment 51.9 per cent of the children were below normal, according to the Wood standards, and 16.3 per cent were more than 7 per cent underweight. At the end of the preliminary period these percentages had increased to 56.7 and 26.9 per cent, respectively. The children taking milk during the second period consumed an average of 0.63 pint per day. The entire group of 104 children showed an average gain of 0.36 lb. per month during the preliminary period and 0.77 lb. per month during the milk-feeding period. The largest gain, an average of 2.92 lbs. per month, was made by the group receiving milk at school, but none at home, and the smallest, 1.09 lbs., by those receiving no milk at all.

Of the children who were more than 7 per cent underweight at the beginning, 23 drank more than a quarter of a pint of milk daily and their deficit changed from 12.2 to 9.5 per cent, while in those who did not take milk the deficit increased from 10.4 per cent at the beginning to 11.1 per cent at the end of the experiment.

On the basis of the physical examination, 36 children had improved in physical condition during the milk-feeding period. Of these, 29 had consumed more than a quarter of a pint of milk daily, 5 had taken no milk at school but had been given milk at home, and 2 received no milk at all.

The possible relation of copper to disease among the Korean people, R. G. MILLS (*Jour. Amer. Med. Assoc., 84 (1925), No. 18, pp. 1326, 1327*).—The observations reported were occasioned by the paper of Mallory on the relation between chronic copper poisoning and hemochromatosis (E. S. R., 53, p. 267). It is noted that in Chosen (Korea) brass is the material of which all food utensils are made. Not only is food cooked and served in brass dishes, but left-over food is allowed to stand from one meal to another in brass. Of various diseases associated in the literature with copper, diabetes of the bronzed type is of rare occurrence among the Koreans, but cirrhosis of the liver is a

common disease. "It is hoped that careful search will be made for evidences of copper poisoning in clinical and necropsy material in the Orient, and special study made of those cases of diabetes and cirrhosis as occasion offers."

The effect of additions of fluorine to the diet of the rat on the quality of the teeth, E. V. McCollum, N. Simmonds, and J. E. Becker (*Jour. Biol. Chem., 63 (1925), No. 3, pp. 553–562, figs. 5*).—This paper includes a brief review of the literature on the occurrence of fluorine in natural foods, water, and animal tissues, and the report of a series of feeding experiments in which a comparison was made of the appearance of the teeth of rats on a balanced diet and the same diet with the inclusion of sodium fluoride to the extent of 226 parts per million. The basal diet consisted of wheat 67.5, casein 15, whole milk powder 10, sodium chloride 1, calcium carbonate 1.5, and butterfat 5 per cent. The diet containing fluorine had the same composition except that 0.1 per cent of a mixture of equal parts of dextrin and sodium fluoride replaced an equivalent amount of wheat. The rats, which included 15 controls and 16 on the fluorine-containing diet, were killed at stated times and careful examination was made of the skull and teeth.

The rats on the fluorine-containing ration were slightly stunted in growth, but were fertile and raised their young. Marked differences were apparent in the teeth of these animals. The incisors grew to abnormal size and in abnormal positions, and were of a dull opaque whiteness entirely lacking in luster. The molars did not differ from normal except that their enamel surfaces were lacking in luster.

In commenting upon these results, attention is called to the fact that defective structure and injuries in the teeth have generally been attributed to dietary deficiencies, but that in the present study it has been demonstrated that overingestion of an element regularly found in both food and tissues may also be harmful.

Some modern tendencies of vitamin research, J. C. Drummond (*Jour. Soc. Chem. Indus., 43 (1924), No. 37, pp. 908–911*).—This is a general discussion, with references to the original literature, of evidence as to the synthesis, function, and chemical nature of the vitamins.

Physiological significance of biosterin (so-called vitamin A), K. Takahashi and J. Nakamiya (*Japan Med. World, 5 (1925), No. 1, pp. 2–9*).—The concentrated preparation of vitamin A previously noted (E. S. R., 50, p. 801) has been used in feeding experiments on rats and mice to determine its quantitative relation to the other constituents of the diet.

The minimum amount of growth was between 0.000001 and 0.000005 gm. With increasing amounts up to 0.01 gm. daily, growth was improved, but with larger amounts growth was less satisfactory and the preparation appeared to be even harmful. In curative tests the same unfavorable effect was noted with excessive dosage. Similar effects were also noted in experiments conducted on dogs.

Vitamin-A deficiency in Denmark and its results, E. Widmark (*Lancet [London], 1924, I, No. 24, pp. 1206–1209, figs. 2*).—This paper is based chiefly upon observations by Blegvad previously noted (E. S. R., 50, p. 772).

Molasses as a source of vitamin B, V. E. Nelson, V. G. Heller, and E. I. Fulmer (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 199–201, figs. 7; also in Planter and Sugar Manfr., 74 (1925), No. 7, pp. 128, 129, figs. 7*).—Four samples of crude cane molasses (blackstrap), three of beet molasses, and two of sorgo molasses were tested for their content of vitamin B as determined by the growth and reproduction records of rats on a diet in which these samples served as the sole source of vitamin B.

Cane molasses proved much richer in vitamin B than either beet molasses or sorgo. At a 5 per cent level growth at slightly below normal, and at 7.5 per cent growth at the normal rate took place. A few litters were born but none were reared on this level. At a 10 per cent level the growth curves were better than normal, reproduction took place, and the animals were carried through the third generation. At a 15 per cent level five generations have been reared.

With 15 and 25 per cent of beet molasses as the sole source of vitamin B the animals grew for a short time and a few young were born, but none were reared. With 20 per cent of sorgo growth took place for about a month. In all cases of failure growth was promptly resumed when 5 per cent of yeast was added to the diet, but the mortality of the young was high even with 8 per cent of yeast.

These results would appear to indicate that yeast is richer in vitamin B than cane molasses, but that molasses is better than yeast for the rearing of young.

Distribution of vitamine X in natural foods, H. M. EVANS and G. O. BURR (*Abs. in Anat. Rec., 29 (1925), No. 5, p. 356*).—Foods of animal and vegetable origin in which vitamin X (E. S. R., 52, p. 262) is present are listed. These include a great variety of animal tissues in which the vitamin is present but not in concentrated form; vegetable tissues such as green leaves, certain fruits (banana), and seeds; and vegetable oils, most of which contain the vitamin in low concentration. The ether extract of wheat embryo and desiccated lettuce leaves are said to contain the vitamin in more concentrated form than any other materials tested.

Cod liver oil, J. C. DRUMMOND (*Jour. Soc. Chem. Indus., 43 (1924), No. 38, pp. 928–932*).—In this paper the author traces historically the therapeutic uses of cod liver oil and the theories concerning its mode of action leading up to the present vitamin theory, and discusses briefly the origin of vitamins in cod liver oil, the manufacture of the oil from the standpoint of the preservation of the vitamins, and the rôle of vitamin A in animal nutrition.

Clinical observations upon the value of oxidised cod-liver oil in the therapy of rickets, R. WAGNER and H. WIMBERGER (*Lancet [London], 1924, II, No. 2, pp. 55–57, figs. 2*).—The histories are given of 4 cases of active rickets in infants aged from 5 to 12 months which were treated with cod liver oil previously oxidized by heating for 24 hours at 120° C. in a current of air. On a daily dosage of 10 gm. there was satisfactory healing of the bone lesions at a slightly slower rate than with the same dose of a crude untreated cod liver oil. The growth-promoting vitamin A content of the two oils as tested on rats was in the ratio of about 1:20.

These results are thought to furnish additional proof that "cod liver oil contains two active organic factors: (1) antirachitic or calcium-depositing, and (2) growth-promoting (vitamin A), and that the latter is the more sensitive to oxidation at a high temperature."

Irradiation of milk and the healing of rickets, S. J. COWELL (*Brit. Med. Jour., No. 3352 (1925), pp. 594, 595, figs. 3*).—The value of irradiated milk in the dietary treatment of infantile rickets is shown in radiograms of the wrists of three children before and after one month on a diet furnishing 1 pint of milk daily as practically the only source of vitamin A. In two cases the milk had been irradiated for 20 minutes by two exposures in shallow dishes to a mercury-vapor lamp at a distance of 3 ft., and in the other nonirradiated milk was used. In the case of the child receiving untreated milk there was only a slight increase in calcification at the lower ends of the radius and ulna, while in the other two cases dense calcification had taken place. "This quite definite and

remarkable 'activating' effect of ultraviolet rays on foodstuffs is obviously well worth following up and opens up new possibilities in the treatment of infantile disorders."

A study of the pellagra-preventive action of dried beans, casein, dried milk, and brewers' yeast, with a consideration of the essential preventive factors involved, J. GOLDBERGER and W. F. TANNER (*Pub. Health Rpts. [U. S.], 40 (1925), No. 2, pp. 54–80*).—In this continuation of the study at the Georgia State Sanitarium of the dietary factors involved in pellagra (E. S. R., 51, p. 270) dried soy beans and California blackeye peas were found to have little, if any, value in the prevention of pellagra. Casein, while having a beneficial effect on the general nutrition and on the dermatitis, did not prevent completely a recurrence of some of the other symptoms of pellagra. Dried milk was partially, but not completely, effective.

Brewery yeast was by far the most effective of any of the substances tested. In patients with marked active symptoms 50 gm. daily brought about marked improvement in from 1 to 4 weeks. In mild cases and in the severe cases on convalescence 15 gm. daily was given at first, and this amount was later raised to 30 gm. In all 26 patients were given this yeast treatment, with prompt recovery in all but 1 very severe case. Among 20 of these patients under observation from 7 to 18 months there has been no relapse or recurrence of the disease.

In discussing the significance of these and previous results, the following general conclusions are drawn:

"A liberal supply of protein presumably of good biological quality does not completely prevent, though it may modify, the clinical picture of pellagra by notably delaying or preventing the development of the distinctive dermatitis. This modifying action may be of an indirect sparing nature.

"In the prevention (and presumably causation) of pellagra there is concerned a heretofore unrecognized or unappreciated dietary factor, which we designate as factor P–P. This may be effective with but little, possibly without any, cooperation from the protein factor. Factor P–P may possibly play the sole essential rôle in the prevention (and causation) of pellagra. Factor P–P is present in brewers' yeast, in milk, and (on the basis of our experience with fresh meat) in lean beef; it is very low or lacking in dry soy beans, dry cowpeas, butter, cod liver oil, and canned tomatoes."

Yeast in the treatment of pellagra and black tongue, J. GOLDBERGER, G. A. WHEELER, and W. F. TANNER (*Pub. Health Rpts. [U. S.], 40 (1925), No. 19, pp. 927, 928*).—In response to inquiries which have been made concerning the yeast treatment of pellagra noted above, additional details are given.

It is considered that when the treatment is combined with the usual dietary treatment a considerably smaller dose than 1 gm. per kilogram of body weight will suffice. The yeast is given in ordinary table sirup or canned tomato juice or milk. The beneficial effects of the treatment have been recognized as early as 2 or 3 days after beginning the treatment. Yeast has also proved effective in similar doses in the early treatment of black tongue in dogs. In closing, it is emphasized that "in all but the severe cases of pellagra careful feeding is all that is needed. In our judgment, it is only in cases of more than average severity, or where such foods as fresh milk and fresh meat can not be procured, that yeast may serve a valuable purpose and may help to save life."

Studies on organisms concerned as causative factors in botulism, I. A. BENGTSON (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 136 (1924), pp. V+96, figs. 2*).—This is the complete report of the author's investigations on the organisms causing botulism, some of which have been noted previously from

other sources. The report is presented in the following sections: Cultural and immunological study of strains of organisms concerned in botulism, further data on type C strains, properties of toxin and antitoxin of organisms concerned in botulism, and standardization of antitoxin. An extensive bibliography is appended.

The treatment of diabetes in children, G. L. BOYD (*Amer. Jour. Diseases Children, 29* (*1925*), *No. 3, pp. 329–346, figs. 7*).—This discussion, which is based upon the author's experience at the Hospital for Sick Children, Toronto, and the Subdepartment of Pediatrics, University of Toronto, deals largely with the dietetic requirements in the insulin control of diabetes in growing children as concerns calories, protein, carbohydrates, fats, and the adjustment of the diet with progress in treatment. The standards for the final diet are summarized as follows:

"The final diet is to be determined by the child's nutritional needs and not by his tolerance. Sufficient insulin is given to render the extra food utilizable and to maintain the blood sugar at a normal level. The caloric requirement is determined by allowing the calories as estimated by Holt for the expected weight of the child, or by giving him twice the expected basal requirement. The results obtained by the two methods are almost the same. The protein requirement is determined by allowing from 2 to 3 gm. of protein per kilogram of expected weight, depending on the age of the child. The remaining calories are distributed between fat and carbohydrate in proportions giving a ketogenic antiketogenic ratio of 1.5:1, unless a lower ratio has been proved necessary."

Endemic goiter in Colorado, R. OLESEN (*Pub. Health Rpts.* [*U. S.*], *40* (*1925*), *No. 1, pp. 1–22, fig. 1*).—Included in this report are the results of several independent goiter surveys in different sections of Colorado, a discussion of the technique of making a thyroid survey, and suggestions for the prophylaxis and treatment of endemic goiter.

The combined results of the four principal surveys showed that of 3,950 boys examined, 1,012 or 25.6 per cent, and of 13,451 girls examined, 4,099 or 30.4 per cent, had some degree of thyroid enlargement. These figures show a smaller difference between the prevalence of goiter in boys and girls than has been reported in surveys in other sections of the country.

The use of iodized table salt is recommended as the most satisfactory method of prophylaxis.

ANIMAL PRODUCTION

Studies on the metabolism of the ruminant by indirect calorimetry, I–V (*Jour. Agr. Sci.* [*England*], *14* (*1924*), *No. 4, pp. 506–530, 600–625, figs. 15*).—The results are given of five studies conducted at the Rowett Research Institute.

I. *The influence of variations in the external temperature on the energy exchange of the goat,* H. E. Magee (pp. 506–515).—The energy exchange in a mature pregnant female goat was determined daily at varying temperatures from November 6, 1922, to February 16, 1923, by the method of indirect calorimetry previously noted by Orr and Magee (E. S. R. 51, p. 371). The daily ration throughout the experiment consisted of 200 gm. of corn, 500 gm. of turnips, and 1,000 gm. of hay, supplying 2,038 calories. In conducting the experiment, four different degrees of temperature were obtained in different rooms, i. e., outside temperature, 48 to 56° F., up to 71°, and up to 100° or above. Samples of air were obtained each morning from the animal in each of the rooms at the end of 45-minute periods. The temperature was

maintained rather constant, and the metabolism was calculated in calories per hour and in calories per kilogram of live weight per hour for each temperature. The curves constructed from the average metabolism at high and low temperatures were very irregular, but between 55 and 70° the rate practically followed a straight line, indicating that the critical temperature was within these limits for the goat, which was acclimatized to the shade temperature in winter. Extreme cold, damp, depressing weather tended under certain conditions to produce a degree of partial hibernation in which the metabolic rate was low.

II. *The influence of pregnancy on the energy exchange of the goat*, H. E. Magee (pp. 516–524).—Metabolism determinations on the goat used in the preceding experiment were continued through parturition on March 27, 1923, and for a succeeding period of 5 weeks. The ration was increased at the close of the preceding experiment from 2,038 calories to 2,386 calories daily. The average hourly metabolism was shown to remain fairly steady to the thirteenth week at 34, with an increase to 51.2 calories per hour in the twenty-first week of pregnancy. A slight fall during the twenty-second week was followed by a greater fall to 37.7 calories during the fifth week after parturition, when the experiment terminated. On a live weight basis there was found to be a distinct increase in metabolism following impregnation, with a gradual fall to the thirteenth week, followed by rapid increases to parturition. The respiratory quotient was irregular to the fourteenth week, with a gradual fall from the sixteenth to the twenty-second week to 0.81, followed by a drop to 0.71 in the second and third weeks after parturition. It is concluded that the pressure of pregnancy tends to shorten the fermentation of the food at first and later lengthens it by impeding the evacuation of the rumen, resulting in a fall in the respiratory quotient. After parturition the food remains for a long fermentation and further lowers the respiratory quotient.

III. *The influence of work on the energy exchange of the goat*, H. E. Magee (pp. 525–530).—In this study the metabolism of a goat was determined by the indirect method while standing and while walking 147 yds. in 1.5 minutes and in 1.25 minutes. About 20 determinations were made in each case, the average in calories per hour being 45.7 at rest, 249.8 while walking at the slower rate, and 291.2 while walking at the more rapid rate. The respiratory quotient increased from 0.78 at rest to 0.82 at the slow walk and 0.84 at the fast walk. The fermentation heat values showed much variability but averaged 2.55, 4.04, and 3.61 calories per hour, respectively. Comparisons of the energy required by man and goats in walking showed that the former was much more economical in its utilization of energy.

IV. *The influence of food on the energy exchange of the goat*, H. E. Magee (pp. 600–618).—This study deals with the effect of ingestion of four different rations designated as mixed, protein, carbohydrate, and fat diets, respectively, on the metabolism of a goat. The subject received hay ad libitum at 5 p. m. each day, and at 9 a. m. the experimental ration was fed. The bulk of each ration is indicated by its average weight, as follows: Mixed diet 800 gm., protein diet 410 gm., carbohydrate diet 450 gm., and fat diet 272 gm. Two basal metabolic determinations were made just prior to the 9 o'clock feeding, and further determinations were made at 30-minute intervals for from 5.5 to 7.5 hours after eating.

The occurrence of parturition during the time that the mixed diet was fed made impossible the formation of a line for basal metabolism, but the base lines for the protein, carbohydrate, and fat diets were comparatively uniform. The metabolism curve increased at the first half hour after eating with the mixed, protein, and carbohydrate diets and remained fairly constant until 2

hours after eating, when there was a big increase at 2.5 hours. The curves for the different diets were not so similar after this period. The metabolism on a mixed diet tended to decrease, while the carbohydrate and protein curves tended to rise after 2.5 hours, reaching their maximum at 4 and 5 hours, respectively. The maximum for the fat diet was obtained at 3.5 hours after ingestion, but a high average increment was maintained over the total period.

The author concludes that "as in omnivora and carnivora (1) protein food has the most pronounced and most lasting effect, (2) fatty foods have a lesser but a lasting effect, (3) carbohydrates have a comparatively small and transitory effect on the heat production of the goat."

The respiratory quotient was found to rise and fall soon after food ingestion, the most marked changes occurring on the protein diet. The respiratory quotients were high on both the carbohydrate and fat rations. The fermentation heat was highest for carbohydrates, followed by the proteins. The quality of the food evidently affected the excretion of fermentation gases during 24 hours. The gas from any feed begins to appear approximately 3 hours after ingestion.

V. *The course of metabolism after food in the goat*, H. E. Magee and J. B. Orr (pp. 619–625).—Determinations of the rate of metabolism were made at 6-hour intervals on the goat used in the above experiments during an 84-hour fasting period. The basal metabolism had been previously determined. The metabolic rate rose to a high peak of 49.6 calories at the twelfth hour, after which it fell rapidly to 36.8 at the thirtieth hour, followed by a rise to 39.4 at the forty-second hour of the fast, with a subsequent decline. The last cudding was observed at the forty-first hour. The authors believe that the postabsorptive state was reached between 42 and 48 hours after the ingestion of food. The respiratory quotient dropped from 0.84 at 12 hours to 0.67 at 42 hours and remained rather constant throughout the balance of the fast. The excretion of fermentation gases decreased very slowly during the postabsorptive period, but had not ceased 84 hours after food intake. The latter phase is discussed.

The sexual glands and metabolism.—I, Influence of castration on nitrogen and gaseous metabolism, V. Korenchevsky (*Brit. Jour. Expt. Path., 6 (1925), No. 1, pp. 21–35*).—This is a report of studies at the Medical Academy at Leningrad of the nitrogen and gaseous metabolism in 4 male and 7 female dogs and 4 male and 1 female rabbits both before and after castration. The determinations after castration were made at periods varying from 3 to 284 days in the dogs and from 4 to 264 days after the operation in the rabbits. In part of the animals castration was followed by an increase in weight and an accumulation of fat, but in others the increase was not so great or actual losses occurred. The subjects were classified accordingly, and in those increasing more than 5 per cent in weight the nitrogenous metabolism and in most cases the gaseous metabolism were decreased, while in animals gaining less than 5 per cent in weight following the operation there was no such decrease in the metabolic rate and the gaseous metabolism was frequently increased.

All results indicated that a retention of protein, as well as an accumulation of fat, followed castration. The mechanism by which castration affects metabolism is discussed, and it is suggested that the effects "are due not only to the direct influence upon metabolism of the removal of the sexual glands, but also to the secondary changes produced by castration in the thyroid, hypophysis, adrenals, and pancreas, as well as to the varying degree of functional efficiency of these glands before castration."

Researches on the feeding value of several varieties of beets [trans. title], Dechambre and Maltterre (*Compt. Rend. Acad. Agr. France, 11 (1925)*,

No. 12, pp. 419–424).—The comparative chemical analyses of one variety each of red, yellow, and white beets are reported, as well as the results of a 51-day feeding test with sheep to compare their nutritive value. The chemical analyses of these varieties indicated that they would rank in the order of red, white, and yellow, but in the feeding experiments with sheep yellow beets produced better gains than white beets, while red beets were superior to both.

The value of some South Australian oats and other fodders, A. T. Jefferis and C. S. Piper (*Jour. Dept. Agr. So. Aust., 28 (1925), No. 6, pp. 511–532, fig. 1*).—This consists of comparative analyses of the green plant, the hay, the ripened plant, the grain, and the straw of 13 varieties of oats grown during 1922 and 1923 at the Roseworthy College. The differences in the analyses of the plants grown in the two seasons were greater than the differences between the varieties. Analyses of Sudan grass, berseem, and two varieties each of wheat, barley, and oats are also given.

The fodder value of different Swedish brans: A summary of results of recent feeding experiments [trans. title], N. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 273 (1924), pp. 33, fig. 1*).—In a total of 18 feeding experiments with milch cows, 12 with work horses, and 5 with fattening swine, the feeding values of wheat, rye, oat, and barley brans have been compared.

Wheat bran was found to be a more valuable feed for milch cows and work horses than for swine. It was somewhat less valuable for milk production than ground oats, but could make up from 30 to 40 per cent of the ration without serious consequences. Rye bran was found to have a similar use to wheat bran. In large amounts it caused a marked reduction in milk production, with an increase in the fat content. Both wheat bran and rye bran had undesirable influences on slaughtering percentages and the quality of the lard in hogs.

Barley bran was more desirable for swine, though it decreased the dressing percentage, but improved the quality of the lard. Oat bran is a very bulky and relatively poor feed, which is best utilized by horses and cattle. The amounts of the different brans required to furnish 1 fodder unit were calculated as follows: 1.25 kg. of wheat bran or rye bran, 1.2 kg. of barley bran, and 1.8 kg. of oat bran. The optimum amounts of bran in the ration were determined as less than 30 to 40 per cent.

The bulletin is summarized in German.

Commercial feeds, W. H. Strowd (*Madison, Wis.: Strowd Co., 1925, pp. VII+288, figs. 37*).—This discusses in successive chapters the manufacture and feeding value of the feeds made from the different cereals and animal products, followed by sections on trade associations, open formulas, and commercial mixed feeds.

Report on inspection of commercial feeding stuffs, 1924, E. M. Bailey et al. (*Connecticut State Sta. Bul. 268 (1925), pp. 496–535*).—A report of the analyses of the feeding stuffs officially inspected during November and December, 1924, as well as samples submitted by individuals (E. S. R., 51, p. 868).

Report of analyses of commercial feed stuffs, H. D. Wilson (*La. Dept. Agr. and Immigr. Feedstuffs Rpt., 1922–23, pp. 96*).—A report of the average guaranties and analyses of the different feeds officially inspected from September 1, 1922, to September 1, 1923.

Analyses of commercial feeding stuffs and registrations for 1925, C. S. Cathcart (*New Jersey Stas. Bul. 415 (1925), pp. 78, fig. 1*).—The usual report of the guaranties and analyses of the feeding stuffs inspected during the year 1924, with registrations for 1925 (E. S. R., 52, p. 167)

Report of the division of feeds and fertilizers on feed stuffs, S. MAWER (*Ohio Dept. Agr., Div. Feeds and Fert. Spring Rpt., 1923, pp. 5–126*).—This is the report of the guaranteed and found analyses of the feeding stuffs officially inspected during the spring of 1923.

Commercial feeding stuffs, September 1, 1923, to August 31, 1924, B. YOUNGBLOOD, F. D. FULLER, and S. D. PEARCE (*Texas Sta. Bul. 324 (1924), pp. 5–157*).—The usual report of the guaranties and analyses of feeds officially inspected during the year ended August 31, 1924 (E. S. R., 51, p. 170).

Commercial feeding stuffs, J. L. HILLS, C. H. JONES, and G. F. ANDERSON (*Vermont Sta. Bul. 244 (1925), pp. 3–32*).—This is the usual report of the inspection of feeding stuffs for 1924, including the guaranteed analyses of brands fulfilling their guaranty and the analyses guaranteed and found of brands failing to meet specifications (E. S. R., 52, p. 671). A brief of the new agricultural seed law, effective January 1, 1926, is also included.

Regulations governing the interstate movement of livestock, effective on and after May 1, 1925 (*U. S. Dept. Agr., Bur. Anim. Indus. Order 292 (1925), pp. 34*).—The text of various acts of Congress and the Federal regulations governing the interstate shipment of livestock is presented.

Feeding for winter beef production, T. B. WOOD (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 9, pp. 804–812*).—A discussion of the feed requirements of beef cattle during the winter in terms of starch equivalent, with suggested rations, and the dry matter, protein, and starch value of the more common feeding stuffs.

Cost of producing baby beef, C. F. BAILEY (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1923, p. 10*).—In a test of the comparative value of dual-purpose Shorthorn steers and steers of the dairy breed for baby beef production, a third-cross Shorthorn and a third-cross Ayrshire were fed to approximately 14 months of age on similar rations.

The results showed that the dressing percentage of the Shorthorn was somewhat higher, as was also the percentage of high-priced meat, and the cost per 100 lbs. of live weight was less than for the Ayrshire.

Fertility in sheep, J. E. NICHOLS (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 9, pp. 835–843*).—The author has presented data relative to fertility in the different breeds of sheep collected at the animal breeding research department of the University of Edinburgh by means of questionnaires sent to members of the breeding societies. The data, based on 133 flocks, are tabulated according to breed, lambing percentage, multiple births, sterility, and sex ratios, and in addition the effect of cross-breeding and flushing on fertility has been noted.

It was shown that fertility was highest in those flocks tending to produce the larger percentage of multiple births. Multiple births appeared most likely to occur from pregnancies initiated during the early part of the breeding season. Flushing tended to increase fertility. Barrenness and abortion are largely attributed to environmental factors, though hereditary factors and the age and condition of the ewe are contributing causes.

Annual wool review, 1924, J. B. MCPHERSON (*Bul. Natl. Assoc. Wool Manfrs., 55 (1925), Extra No. 1, pp. 127–273, pls. 4, fig. 1*).—A review of the wool situation in the United States and foreign countries during 1924, with comparative statistics from 1923, as in the preceding report (E. S. R., 51, p. 275).

Digestion trials with swine, T. B. WOOD and H. E. WOODMAN (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 498–505, figs. 2*).—The authors describe the harness and a metabolism crate designed for conducting digestion experiments with swine at Cambridge University. The crate was so constructed that the

subject could stand or lie down, but could not turn around and could not get its feet in the feed trough. The urine was collected as it ran off the floor, while the feces were separated by rolling down a rubber apron attached by an adjustable harness.

The results of a 10-day trial of the digestibility of soaked barley meal as determined with a 286-lb. pig, using this apparatus, are reported. A comparison of these results with the digestibility of barley meal as determined by ruminants showed much similarity in the digestibility of organic matter, crude protein, nitrogen-free extract, and the productive starch value, but only 10.8 per cent of the crude fiber was digested by the pig and the fat digestion was negative. The mean daily nitrogen balance during the trial was 4.3 gm.

[Hog feeding experiments at the Torrington, Wyo., State Farm] (*Wyoming Sta. Rpt. 1924, p. 172*).—The results of pig feeding experiments indicated that 100 lbs. of Wyoming-grown corn produced 26.8 lbs., while an equal amount of imported corn produced 24.3 lbs. of pork. Pigs fed corn and water in dry lot made practically no gains. Other pigs receiving white corn and tankage with minerals made practically the same gains as those receiving yellow corn in the same combination.

The production of fall pigs in Alberta, J. P. SACKVILLE and R. D. SINCLAIR (*Alberta Univ., Col. Agr. Bul. 7 (1923), pp. 35, figs. 9*).—In addition to a brief discussion of fall pig production in Alberta, the results of three years' experiments are presented.

In each experiment outdoor and inside and hand-feeding cooked feeds and self-feeding were compared. There was little difference in the gains made by the different lots, and it was calculated that all made satisfactory profits. The feeding of cooked feeds tended to produce damp quarters, which made the pigs less attractive.

Investigations at the experiment station relating to economical pork production in 1923 [trans. title], N. HANSSON and S. BENGTSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 266 (1924), pp. 24, fig. 1*).—In a comparison of the rates and economy of gains, Swedish farm-bred pigs were found somewhat superior to Yorkshires, the average daily gains per head being 626 and 620 gm. (1.38 and 1.36 lbs.), respectively, requiring 3.71 and 3.79 fodder units per kilogram of gain. The same feeds consisting of cereals and by-products were given to both breeds. The slaughter data were slightly in favor of the Yorkshires, in which the loss amounted to 25.1 per cent as compared with 27.5 per cent for the Swedish farm breed. The Yorkshires slightly excelled in quality of meat as judged by the development of the belly pork, size of ham, and fineness of bone. The Swedish breed excelled in fullness of meat and dispersion of back fat.

Feed cost of raising young horses, C. F. BAILEY (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1923, pp. 14, 15*).—Data recorded on the colts raised at the station showed that 6 colts consumed an average per head of 120 lbs. of bran, 435 lbs. of oats, 723 lbs. of hay, and 16 lbs. of roots during the first 6 months, reaching an average weight of 641 lbs. Five foals consumed an average of 343 lbs. of bran, 1,247 lbs. of oats, 448 lbs. of hay, and 187 lbs. of roots during the first year, at the end of which time their average weight was 783 lbs. Three colts consumed an average of 655 lbs. of bran, 2,320 lbs. of oats, 5,234 lbs. of hay, 347 lbs. of roots, and were 5 months on pasture to two years of age, at which time they averaged 1,088 lbs. in live weight.

Missouri State Poultry Association Year Book, 1923, N. HALL (*Mountain Grove: Missouri State Poultry Assoc., [1924], pp. 150, figs. 3*).—This consists of a report of the various departments of the State Poultry Station, several

articles of popular interest, and other material. The results of some of the experimental work follow, and three articles are noted on pages 680 and 695.

Preliminary feed experiments, S. Eriksen (pp. 22–28).—In studying the effect of adding or removing certain grains from the ration of baby chicks, 8 lots consisting of 35 chicks in 7 of the pens and 28 in the eighth pen were selected. All pens except one received a basal ration of white shorts, wheat middlings, white corn chops, and meat scrap, 2:2:5:1. The exceptional pen received the basal ration without meat scrap plus greens, grit, and oyster shell, with straw litter. The additions to the basal ration in the other pens included dry yeast, grit, and oyster shell, without litter; yeast, grit, oyster shell, and paper ad libitum, without litter; greens, grit, oyster shell, and straw litter; greens, yeast, grit, oyster shell, and straw litter; greens, grit, and straw litter; grit, oyster shell, and straw litter; and greens, grit, oyster shell, and straw litter. The last-named pen was kept darkened. The early morning sun was screened through muslin.

The results showed that a lack of greens in certain of the rations was followed at about the eighth week by the occurrence of symptoms of summer roup. The birds not too far gone recovered when cod liver oil was administered. There was a very high mortality in the pens not receiving green feed. A possible value for bulk (paper) in place of greens was indicated. The pen receiving no animal protein was stunted and unthrifty and 32 of the 35 birds died. Supplying animal protein to some of these birds resulted in improving the rate of growth and appearance. Replacing these birds on the protein-deficient ration was followed by abnormal development. Yeast seemed to have little, if any, favorable effect on the growth rate or mortality of the chicks.

The value of vitamines in salvaging chicks which require help in emerging from the shell, S. Eriksen (pp. 28, 29).—In studying the effect of vitamins on weak chicks and those having difficulties in hatching, 10 such chicks were given 0.5- and 1-cc. doses of dried yeast mixed with about double the amount of water. Two of the chicks died in 48 hours, 6 in 5 days, 1 in 10 days, and 1 developed normally. One of 10 chicks given doses of 0.5 or 1 cc. of cod liver oil developed normally, while the others all died in 5 days. Of 19 weak chicks reserved as controls, only 10 died during the experiment.

What happens to dirty eggs, washed and not washed, E. Eriksen (pp. 29–31).—Two lots each of fertile and infertile eggs were used for comparing the hatchability and keeping qualities of eggs having fecal matter left on them or washed off when stored in an incubator at 103° F., in a basement at 68°, and at room temperature (74°). Infertile controls were kept at each temperature. The results showed that the fertile and infertile eggs showed few signs of deterioration when kept in a dry place, even though they were covered with feces. Similar eggs when washed deteriorated rapidly, the rate being in direct proportion to the storage temperature.

Missouri State Poultry Association Year Book, [1924], and biennial report of the Missouri State Poultry Board for the years 1923–1924, N. HALL (*Mountain Grove: Missouri State Poultry Assoc., [1925], pp. 165*).—In addition to the usual material in this biennial report (E. S. R., 50, p. 871), including papers of popular interest, the results of experimental work are given as noted on page 681 and below.

Experiments in nutrition, S. Eriksen (pp. 29–31).—In studying the effect of direct sunlight, boiled eggs, ground soy beans, and yeast on the growth and mortality of chicks, it has been found that hard-boiled eggs were a good source of food for very young chicks, but soy beans mixed with other grains were not satisfactory. In the yeast-fed pen the mortality was somewhat less, but no

differences in the weight records were indicated, and eggs were laid in the pen not receiving the yeast 51 days before they were laid by birds in the pen receiving the yeast. Chicks raised under glass did not suffer any handicap.

The effect of confinement, sprouted oats, and codliver oil on production, fertility, and hatchability, S. Ericksen (pp. 31, 32).—Four pens of 15 Single Comb White Leghorn pullets each were selected for this investigation which lasted from February to December 31, 1924. A basal ration of wheat bran, red dog flour, corn meal, ground oats, meat scrap, and salt, 24 : 24 : 29 : 9 : 12.5 : 1.5, was fed to all lots.

Lot 9 was allowed the run of a yard containing green oats later in the season and 5 per cent of cod liver oil was added to the basal ration. Lot 10 received the run of a yard plus all the sprouted oats they would clean up. Lots 11 and 12 were given only the basal ration, the former being allowed the run of a yard, while the latter was confined to the pen. The percentage of production, fertility, and hatchability for the eggs of the different lots was, respectively, lot 9, 31.5, 82, and 22.6; lot 10, 36.4, 84.5, and 35.2; lot 11, 34.2, 78, and 39.1; and lot 12, 23, 73.7, and 29.5 per cent. The results showed that the confinement to the pen tended to lower production, fertility, and hatchability, while sprouted oats seemed to increase these characters slightly when given in addition to the run of a yard. No particular value was demonstrated for the addition of cod liver oil.

An experiment on yeast and two different amounts of animal proteins, S. Ericksen (pp. 32–35).—Three pens of Rhode Island Reds were selected when the sexes could be distinguished and fed on the following rations, together with greens, oyster shell, and cracked corn: Pens 4 and 5, corn meal, wheat middlings, and meat scrap, 5 : 4 : 1, with supplements of from 1 to 2 per cent of yeast in pen 5. Pen 6 received a similar ration except that 1 part of the meat scrap replaced 0.5 part each of corn meal and wheat middlings. The average weekly weights indicated that the amount of protein in pen 6 had no appreciable effect on growth. Pen 5, which was heavier at the start, maintained the difference in weight throughout. The first eggs were laid in pens 4, 5, and 6 at 35, 28, and 34 weeks of age, respectively. The percentage production from February to August was 1.2, 1.5, and 1.9 in pens 4, 5, and 6, the percentage of fertility was 80.4, 66.3, and 88.9 per cent, respectively, and the hatchability was 26.2, 12.0, and 26.7, respectively. Though growth was not influenced, egg production was increased by the higher protein content of the ration of lot 6. The effects of yeast were less definite.

The effect on hatchability of dipping eggs in various chemicals, S. Eriksen (pp. 35–37).—In one experiment in which eggs were dipped for 5 minutes prior to incubation in solutions of 5 per cent creolin, 0.1 per cent mercuric chloride, sterilac 1 : 3,000, 5 per cent carbolic acid, gasoline, 95 per cent alcohol, wood alcohol, potassium permanganate 1 : 1,000, and 4 per cent formaldehyde, the treated eggs all hatched better than a lot of eggs receiving no treatment. In another experiment kerosene and gasoline seemed to reduce the hatchability, while water, denatured alcohol, or bichloride of mercury 1 : 1,000 had no effect on the hatchability or on the development of the chicks.

The effect of low temperatures on the hatchability of eggs, S. Eriksen (pp. 38–40).—In studying the effect of storing eggs for varying periods at 32° F. on the hatching properties, no injury seemed to result from such storage for 5, 10, 12, and 15 days, but 45 days' storage at this temperature prevented development. Twenty-five days at from 28 to 32° or 4 days at 0° likewise prevented normal development of the embryo. Some eggs were wrapped separately for storage while others were placed in regular shipping cartons, but

no significant differences in the hatching qualities were evident. The chicks from the eggs stored at the lower temperatures were normal in every way.

Time required for fertilization of eggs, S. Eriksen (pp. 40, 41).—The first eggs laid by White Leghorn pullets after males were put in the pens were incubated to determine the time required for the production of fertile eggs. The first fertile eggs appeared on the third day, while average fertility was reached on the seventh day.

A study of the phosphorus, calcium, and alkaline reserve of the blood sera of normal and rachitic chicks, C. W. Ackerson, M. J. Blish, and F. E. Mussehl (*Jour. Biol. Chem., 63 (1925), No. 1, pp. 75–84, fig. 1*).—In studies at the Nebraska Experiment Station, White Leghorn chicks were found to develop rickets on a basal ration lacking the antirachitic factor and when the basal ration was supplemented with sunlight filtered through glass, copper arc light radiation, and with water and pressure extracts of alfalfa meal and the fresh green material. Supplements of direct sunlight, direct sunlight plus 5 per cent of yeast, 1.5 per cent of cod liver oil, and copper arc light plus 1.5 per cent of cod liver oil prevented the occurrence of rickets in other lots. Six birds receiving the 1.5 per cent cod liver oil supplements and averaging 419 gm. in weight developed leg weakness in 10 days after being changed to the basal ration.

Blood was drawn directly from the heart of rachitic and normal chicks for quantitative calcium, inorganic phosphorus, and plasma bicarbonate determinations. The average content of calcium in 56 normal birds was 10.61 mg. and of phosphorus in 68 normal birds was 4.60 mg. per 100 cc. of blood serum. The blood of 66 rachitic chicks contained an average of 7.49 mg. of calcium and 3.91 mg. of phosphorus. The blood of the birds changed from the cod liver oil to the basal ration showed a similar composition. No significant differences occurred in the amounts of bicarbonate in the blood plasma of rachitic and normal birds.

Presence of the antiscorbutic substance in the livers of chickens fed on scorbutic diets, C. W. Carrick and S. M. Hauge (*Jour. Biol. Chem., 63 (1925), No. 1, pp. 115–122, fig. 1*).—In experiments at the Indiana Experiment Station, cockerels which had been fed for an extended period on a scorbutic diet were killed and the potency of the vitamin C in the macerated livers and kidneys was tested by feeding them with a vitamin C-free diet to guinea pigs suffering from scurvy. Eight guinea pigs were used in the experiments, 2 of which received no supplements, while the other 6 received supplements of 5, 10, or 15 gm. of liver daily or 10 gm. of kidneys.

The results indicated the presence of the antiscorbutic factor in the livers. The production of this factor by birds receiving a diet lacking in vitamin C is discussed.

All breeds of poultry, F. L. Platt (*Chicago: Amer. Poultry Jour., 1925, pp. 226, figs. 190*).—Brief descriptions of the established breeds of poultry

The standard deviation in the weight of White Leghorn eggs, H. Atwood (*West Virginia Sta. Bul. 195 (1925), pp. 22*).—This consists of a study of the variation in the weights of the eggs laid by the flocks previously described (E. S. R., 50, p. 675). The data include the weights of the eggs laid during the first, second, and third years by flocks A and B fed liberal and limited amounts of sour milk in addition to a basic ration; first and second years' production for flocks C and D, the offspring of lots A and B, respectively, fed similarly to their parents; and the first year's production of flocks E and F, the offspring of the above four flocks.

The standard deviation of the egg weights produced during the three years by flocks A and B showed that there was more variation in both flocks during the first year than in the second or third years among the eggs of individual hens. This was explained as due to the small eggs of pullets, which increase in size as age increases. The first year's variation was greater in well-fed flocks, as such pullets started to lay at a younger age, and the first eggs were smaller. There was no significant difference in the standard deviation of the weights of the eggs laid during the second and third years. The average standard deviation among the egg weights of individuals in the different flocks for the eggs laid in the first year varied from 2.80 ± 0.05 to 3.57 ± 0.13 gm. The second year's eggs of the four flocks ranged in mean standard deviation per flock from 2.61 ± 0.08 to 2.73 ± 0.12 gm., and the standard deviation of the egg weights of the two flocks which produced eggs during the third year were 2.72 ± 0.05 and 2.72 ± 0.07 gm.

The method of feeding had no significant influence on the variability of the egg weights beyond that mentioned in the first year. The variability in the different months was calculated for one year's production, 1922–23, for all flocks, but no differences were evident when sufficient numbers were included. Correlations determined between the numbers of eggs laid and the standard deviation of the egg weights were mainly not significant, but the degree of variability among the eggs of individuals tended to persist in succeeding years. The results are discussed in relation to the material presented in other bulletins from the station (E. S. R., 31, p. 270; 38, p. 577; 50, p. 675).

On the physics of incubation, A. P. Chattock (*Roy. Soc. London, Phil. Trans., Ser. B, 213 (1925), No. B 409, pp. 397–450, figs. 16*).—This is a study of the effect of turning and cooling, humidity and ventilation, and loss of weight of eggs during artificial and natural incubation on the percentage hatchability.

Increasing the number of times that the eggs were turned in incubators from 2 to 5 times daily tended to increase the hatching from 6 to 10 per cent. Additional cooling did not improve the hatching percentage of the eggs. Measurements of the ventilation of the hens' nests showed that it was equivalent to 32 cu. ft. of air per hour for 50 eggs, which is much less than occurs in the artificial incubator.

Detailed data on the effect of temperature, calculated humidity, and evaporation are also discussed.

Turkeys: Their care and management, A. G. Taylor (*Canada Dept. Agr. Bul. 46, n. ser. (1925), pp. 13, figs. 5*).—Popular directions for care, management, feeding, and breeds of turkeys, with descriptions and treatment of diseases.

Blood calcium in relation to sex in pigeons, O. Riddle and H. E. Honeywell (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 222–225*).—The authors present the results of determinations of the calcium contents of the blood of 10 male and 8 female common pigeons, 5 male and 7 female ring doves, and 13 hybrids between them, which are always males. Two determinations were made for most of the birds. The results, though showing considerable variability especially in the females, indicate a lower blood calcium content for males. Determinations on the hybrids were intermediate between those of the males and females of the two families. Some of the females were actively producing eggs, which possibly accounts for their extreme variability.

DAIRY FARMING—DAIRYING

Further experiments on the replacement of protein by urea for lactating animals [trans. title], A. Morgen, C. Windheuser, and E. Ohlmer (*Landw. Vers. Sta., 103 (1924), No. 1–2, pp. 1–40*).—In continuing the studies of the pro-

tein replacement value of urea (E. S. R. 48, p. 376), 5 sheep were fed for 3 periods and 8 goats for 5 periods. Part of the experimental animals were fed on a basal ration low in protein which was calculated to supply from 13.4 to 15 kg. of starch value and 1.5 to 1.7 kg. of digestible pure protein per 1,000 kg. of live weight. The basal ration of the rest of the animals was high in protein, being calculated to supply from 13.7 to 14.8 kg. of starch value and 2.8 to 3.4 kg. of digestible pure protein per 1,000 kg. of live weight.

The sheep received the basal rations during the first and third periods, with the addition of 29.7 gm. of urea per head daily during the second period. This was calculated to supply 240 gm. of nitrogen per 1,000 kg. of live weight. The basal rations were fed to the goats during the first, third, and fifth periods, and during the second and fourth periods the rations of the different animals were supplemented with sufficient urea, water-soluble ammonium acetate, or soy bean oil meal to furnish from 250 to 260 gm. of nitrogen per 1,000 kg. of live weight. The effects of the nitrogenous supplements on the quantity and quality of the milk are summarized in the following table, which shows the percentage of milk, butterfat, anud nitrogen produced in the milk during the period when the supplement was fed as compared with the average of the prior and succeeding periods:

Quantity and quality of milk produced

Ration	Sheep			Goats		
	Amount of milk	Amount of fat	Amount of milk nitrogen	Amount of milk	Amount of fat	Amount of milk nitrogen
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Low protein plus urea	92.0	109.6	98.2	96.4	103.4	102.5
High protein plus urea	91.5	95.9	96.2	86.8	100.1	95.1
Low protein plus ammonium acetate				96.6	127.5	108.9
High protein plus ammonium acetate				92.1	100.8	96.1
Low protein plus soy bean meal				100.9	89.4	99.1
High protein plus soy bean meal				108.4	107.2	116.6

The authors conclude that any favorable result from the addition of urea to the low protein rations was in the fat produced, while the effects of the ammonium acetate were much more pronounced. The nonprotein nitrogen in the milk was shown to be materially increased, however. The nitrogen balances were not greatly affected by the urea or ammonium acetate supplements, excess nitrogen occurring in large amounts in the urine.

Kellner tested in practice, G. TURNBULL (*Jour. Bath and West and South. Counties Soc., 5. ser., 18 (1923–24), pp. 92–99*).—The author reports the rations and milk production of cows kept under observations which indicate that Kellner's requirements for milk production are too low. It is concluded that the roots or dry roughage in the ration may have lowered the digestibility of the entire feed.

[Experiments with dairy cattle at the Wyoming Station], J. A. HILL (*Wyoming Sta. Rpt. 1924, pp. 166, 167*).—The results of experiments in feeding for milk production and in feeding dairy calves are briefly noted.

Native hay v. alfalfa for milk production.—Preliminary results of studies of the value of various hays for milk production have indicated that the native hay of the Laramie Valley is superior to prairie hay and other wild hays and also to timothy hay. No combination of hay and protein concentrates has been found equal to the standard ration of alfalfa, silage, cereal grain, and a small amount of cottonseed cake.

Skim milk v. grain for dairy calves.—Preliminary feeding tests have indicated that a large portion of the skim milk usually fed to calves may be replaced by grain with satisfactory results when plenty of good alfalfa hay is supplied.

[Feeding experiments for milk production], W. H. HICKS (*Canada Expt. Farms, Agassiz (B. C.) Farm Rpt. Supt. 1923, pp. 9, 10*).—The following comparisons of succulent feeds have been conducted:

Dried beet pulp v. mangels.—Four cows were fed during 3 periods of 2 weeks each for making a comparison of these succulent feeds. All the animals received 12 lbs. per head daily of a grain mixture of bran, oat chop, oil cake, and corn meal, with 51 lbs. of silage and 5.25 lbs. of cut hay. During the mangel feeding, 60 lbs. per day were given the animals, while 6 lbs. of beet pulp were fed during the other periods for comparison. Molasses was fed with the beet pulp at the rate of 0.75 lb. per head daily. The average results of the experiment showed that the cows when receiving mangels produced an average of 26.66 lbs. of milk daily as compared with 28.31 lbs. when receiving beet pulp. The fat percentage of the milk was 0.02 per cent greater on the beet pulp ration.

Corn silage v. sunflower silage.—In this comparison 9 cows were selected for each lot. The average daily feed consisted of 12 lbs. of grain per head daily, 20 lbs. of pulped mangels, 5 lbs. of clover hay, and all the silage that the animals would consume, averaging 60 lbs. of sunflowers and about 67 lbs. of corn silage per cow daily. The average milk production with corn silage was 33.6 lbs. and with sunflower silage 31.52 lbs. The butterfat percentage in the milk averaged 0.12 per cent greater with the corn silage. It was calculated that the feed cost of milk per 100 lbs. was $1.37 with corn silage and $1.41 with sunflower silage.

Turnips, corn ensilage, and sunflower ensilage [for dairy cattle], W. W. BAIRD (*Canada Expt. Farms, Nappan (N. S.) Farm Rpt. Supt. 1923, pp. 9, 10*).—The results of a comparative test of these three succulent feeds for milk production are reported. Three groups of three cows each were fed each feed for 21 days during three successive periods, only the last 7 days' production of each period being used for comparison. The combined results for all cows showed that the average daily milk production during the comparative periods was 19.19 lbs. per cow with turnips, 17.04 lbs. with corn silage, and 17.81 lbs. with sunflower silage. It is pointed out that turnips, though more expensive per ton, produced the cheapest milk.

Silage vs. oat hay vs. roots, J. A. STE. MARIE (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que.) Sta. Rpt. Supt. 1923, pp. 8, 9*).—Twelve milking cows were fed during 3 periods of 3 weeks each for comparing corn silage and oat and pea hay as components of the ration of dairy cattle. The average daily milk production during the first and third periods when silage was fed was 19.1 lbs. as compared with an average production of 18.6 lbs. when oat hay was included in the ration.

In another experiment corn silage and roots were similarly compared. The average daily production of milk during the first and third periods when the silage was fed was 15.8 lbs., as compared with 16.4 lbs. during the second period when roots made up a portion of the ration. The author concludes that though oat hay was not equal to silage for milk production, its use would be advocated if silage was not available. Roots proved a very satisfactory substitute for silage.

[Experiments with dairy cattle at the La Ferme Experimental Station], P. FORTIER (*Canada Expt. Farms, La Ferme (Que.) Sta. Rpt. Supt. 1922–1923, pp. 5–6*).—The records of feed consumed for cows finishing a lactation period

have been tabulated and the cost of milk calculated therefrom, the average cost being $1.87 per 100 lbs. during the calendar year 1922 and $1.86 for 1923. The amounts of the different feeds consumed, with their estimated value, are given for 6 heifers raised to ages of from 10 to 29½ months, and the amounts of feed consumed by calves, with the calculated costs of each, are reported in tabular form.

Dairy farming on arable land, J. STRACHAN (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet] 138 (1925), pp. [2]+54, pls. 2, figs. 6*).—A summary of a four years' study of the use of soiling crops for feeding dairy cattle at the Rawcliffe, Yorkshire, Soiling Farm.

A variety of crops were used, which included oats and peas; rye and tares; rye and peas; winter oats and tares; wheat and tares; peas, beans, oats, tares, and barley; buckwheat, peas, and rape; mangels; white turnips; and spring and winter cabbages. The results show that the farm did not pay during the first three years but showed a profit in the fourth year. A comparison of the costs of producing milk on grazing farms showed that the cost was greater with the soiling crops. A new system of cropping is planned for the future which will reduce the labor required and increase the time during which the land is utilized. Milk production data on the different soiling crops are tabulated for each year and compared with other farms.

Rearing calves by the use of calf-meal gruel, L. A. MAYNARD, L. C. NORRIS, and W. E. KRAUSS (*New York Cornell Sta. Bul. 439 (1925), pp. 3–23, pls. 2, figs. 5*).—The results of the experiments in the use of a calf meal for raising calves previously noted (E. S. R., 50, p. 578) are similarly reported, as well as the results of a third trial in which 6 purebred and 1 grade Holstein and 1 purebred Shorthorn calves were raised. Records of the grain and hay as well as the calf meal and milk consumption were kept during the third trial. The average feed consumption from birth to 6 months of age was for the Holsteins 518 lbs. of whole milk, 287 lbs. of calf meal, 412 lbs. of hay, and 189 lbs. of dry grain. Good growth was made, the average gain in live weight per calf being 297 lbs. Several of the calves showed a setback in the regularity of their gains following the complete change from milk to gruel.

A study of the residual effects of the calf meal indicated that the calves raised on this meal were in no way handicapped in their development, some having already produced calves and others are approaching maturity.

Measuring the breeding value of dairy sires by the records of their first few advanced registry daughters, F. A. DAVIDSON (*Illinois Sta. Bul. 270 (1925), pp. 545–566, figs. 18*).—A study has been made of the reliability of the milk production of the first few daughters of a bull as an indicator of the average production of all his daughters. The records of the daughters of the 133 sires having over 15 daughters each which are listed in the 1911 to 1921 volumes of the Register of Merit of the American Jersey Cattle Club was used as a basis for the investigation.

The milk records were first corrected according to the age of the daughters and the fat percentage of the milk. The constants for measuring variability were found to be many times their probable error when the milk production of the first 15 tested daughters of the bulls were averaged. These constants and the mean production were changed only slightly when larger numbers of daughters were included, therefore the average production of the first 15 daughters was considered as the correct indication of the bull's ability. In order to determine the smallest number of daughters that would give similar results, the daughters and records were grouped as the first daughter, first two daughters, first three daughters, etc., and the constants determined were correlated and compared with the constants of the first 15 daughters.

Differences were likewise determined between the production of the 15 daughters and the average production in each of the groups.

The results showed that the coefficient of correlation between the average production in the different groups and the 15-daughter group increased rapidly from 0.552±0.041 for the first daughter to 0.895±0.012 for the 4-daughter group, after which the increase with succeeding groups was much reduced, especially after the sixth group. The mean difference and standard deviation of the difference between each group and the fifteenth group followed a similar course. The standard deviations and coefficients of variability for the milk yields were very similar in all groups. The limits calculated at odds of 30:1 and 100:1 within which differences in the production of the different groups and the fifteenth group would be expected to occur are tabulated and shown graphically. All the data indicated that the first 6 daughters were the smallest number that could be depended on to give a reliable indication of the bull's productive capacity. These results were also found applicable to the records of daughters of 5 Guernsey and 5 other Jersey sires.

Cow-testing associations and stories the records tell, J. C. McDowell (*U. S. Dept. Agr., Farmers' Bul. 1446 (1925), pp. II+22, figs. 14*).—The purpose, organization, accomplishments, and methods of conducting cow-testing associations in the United States are briefly described.

The germicidal action of milk, J. M. Sherman and H. R. Curran (*Soc. Expt. Biol. and Med. Proc., 22 (1924), No. 1, pp. 15–17*).—In studies at the New York Cornell Experiment Station rapidly growing cultures of *Streptococcus lactis* inoculated into autoclaved milk showed no lag in their growth rate, but a slight but definitely inhibitory effect on growth was evident for a short period following similar inoculations into freshly drawn milk.

The cause and prevention of mould in Canadian pasteurized butter, E. G. Hood and A. H. White (*Canada Dept. Agr. Bul. 48, n. ser. (1925), pp. 20, figs. 10*).—A popular discussion is given of the means by which molds and yeasts get into butter, with directions for the prevention of molds, largely through pasteurization of cream and the practice of cleanliness and prevention of contamination after pasteurizing.

Neutralization and homogenization of the ice cream mix and their relation to viscosity and overrun, H. A. Bendixon (*Creamery and Milk Plant Mo., 14 (1925), No. 4, pp. 83–86, 90*).—In studies at the Idaho Experiment Station it was found that increases in the acidity of the ice cream mix from an average of from 0.217 to 0.371 per cent decreased the overrun 5.18 per cent and increased the viscosity from 275 to 394. Neutralization of the acid mixes with sodium hydroxide resulted in an average of 8.85 per cent reduction in the overrun as compared with 16.9 per cent when limewater was used. Neutralized mixes always gave lower overruns than unneutralized. Differences were also observed in the overrun and acidity of mixes made from different types of milk products.

The effects of homogenization on the ice cream mix are discussed, based on the results of other investigators.

Time, temperature, and overrun tests on freezing, T. Hall (*Ice Cream Trade Jour., 20 (1924), No. 10, pp. 51–54, figs. 9*).—Freezing tests conducted on ice cream mixes containing 10.75 per cent of butterfat, 38 per cent of total solids, and 0.21 per cent of acidity have shown that the best results with regard to overrun are likely to be obtained when the brine is used at 0° C., the brine and mix valves are opened at the same time, the brine valve is closed 3 minutes thereafter, and the mix drawn after 11 minutes.

What influences overrun and quality? J. A. CLUTTER (*Ice Cream Trade Jour., 21 (1925), No. 3, pp. 56–58, figs. 2*).—In studies at the Texas Agricultural College, the effect on the overrun and quality of ice cream resulting from the addition of varying amounts of gelatin and the substitution of butter for cream in the ice cream mix was determined. The mixes were prepared with 16 per cent sugar and 0, 0.25, 0.50, and 0.75 per cent gelatin. The entire mix was pasteurized after adding the gelatin and flavor. After aging for 24 hours, the mix was whipped until a 100-per cent overrun was obtained.

The results showed that gelatin and butter both tend to increase the viscosity. Ice cream containing 0.5 per cent gelatin in the mix seemed usually to be superior in texture.

VETERINARY MEDICINE

Immunological notes, I–VII, A. T. GLENNY, C. G. POPE, H. WADDINGTON, and U. WALLACE (*Jour. Path. and Bact., 28 (1925), No. 2, pp. 333–344*).—In connection with a detailed study of immunity to diphtheria, a series of short notes on observations of possible bearing on the mechanism of immunity response is reported, with the following conclusions:

Individual guinea pigs show differences in the response to the injection of an antigen. These differences may be lessened by careful selection of uniform healthy animals. A greater response to the same amount of diphtheria toxoid is obtained when the injection is made intraperitoneally or subcutaneously in dilute form than subcutaneously or intracutaneously undiluted or intramuscularly either diluted or undiluted. Young guinea pigs are less readily immunized than older ones. The antigenic value of modified toxin can be increased considerably by the addition of sublethal doses of toxin. Modified toxins retain from 5 to 10 per cent of their original antigenic power after boiling. Partial neutralization with antitoxin does not reduce to a great extent the antigenic value of modified toxin. Immunization can be secured by daily injections of very small amounts of toxin.

A preliminary report on the use of mercurochrome 220, J. V. LACROIX (*North Amer. Vet., 6 (1925), No. 5, pp. 66–68*).—This report is based on the rather extensive use of mercurochrome, both clinically and experimentally and chiefly in dogs, over a period of five months.

The author concludes that it is far superior to tincture of iodine for routine surgical uses and wherever iodine has been employed. Because of its greater penetrating qualities, it has much greater germicidal efficacy. The use of the ordinary 2 or 3 per cent solutions on recently abraded tissue is painless. It is pointed out that a 1 per cent solution may be used in the conjunctival sac, in the ears, or to swab the throat in dogs. A solution of 0.5 per cent is recommended for all-round use intraperitoneally. Five cc. of a 1 per cent solution may be given to the average 10-lb. dog with safety and with no bad after effects. It has a favorable influence in many septic affections, such as suppurative conjunctivitis attending panophthalmia and intoxications involving the digestive tract, and it is of benefit in some cases of incipient distemper.

Anaerobic infections in animals, S. H. GAIGER (*Jour. Compar. Path. and Ther., 37 (1924), No. 3, pp. 163–192*).—In this paper the author discusses recent views of research workers regarding certain anaerobic infections in animals, including *Bacillus chauvoei*, *Vibrion septique*, *B. welchii*, *B. oedematiens*, *B. histolyticus*, *B. sporogenes*, and *B. botulinus*. A list is given of 54 references to the literature.

Station work on infectious abortion, W. A. HOOKER (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1923, pp. 75–82*).—This is a brief summary of station work, with 70 references to the literature.

The channel of invasion of Bacterium abortum with special reference to ingestion, R. R. Birch and H. L. Gilman (*Cornell Vet., 15 (1925), No. 2, pp. 90–120, fig. 1*).—In experiments conducted by the authors "infection of pregnant heifers, as indicated by high and persistent agglutinin titer, abortion, and positive bacteriological findings in uterine contents and milk, was readily brought about by sprinkling the feed with *B. abortum* suspensions. The close relation between the date when the infectious material was fed and the appearance of the manifestations just enumerated, as well as the high percentage of animals infected as compared to the completely negative record of the controls, suggest that ingestion is a common channel of infection as applied to *B. abortum.*"

Researches regarding epizootic abortion of cattle, J. M'Fadyean (*Jour. Compar. Path. and Ther., 37 (1924), No. 3, pp. 192–203*).—The author here gives the history of a valuable pedigreed herd in which tests were repeated at intervals during a period of 10 years, but in which no proper segregation of infected animals could be arranged.

A mold associated with abortion in cattle, H. L. Gilman and R. R. Birch (*Cornell Vet., 15 (1925), No. 2, pp. 81–89, pls. 2*).—The authors report upon the recovery during a period of three years of a mold of the genus Mucor from three aborted fetuses from the same herd. The mold and associated pathological lesions were practically identical with those described by Smith (E. S. R., 42, p. 778). "Experimental inoculation of five pregnant cows with a suspension of the mold produced placental infection without abortion in one and placental infection with abortion in another. In each of these cases a pure culture of the mold was recovered. There were negative findings in the other three. . . . As a result of the findings, we believe that a mold of the genus Mucor can be definitely added to the group of organisms which produce abortion in cattle."

Note on the occurrence of anaplasmosis in Palestine, G. Stuart, K. S. Krikorian, and S. J. Gilbert (*Jour. Compar. Path. and Ther., 37 (1924), No. 3, pp. 149–154, figs. 3*).—The authors report upon a case of anaplasmosis in a cow imported from Beirut into Palestine, in which the parasite was transmitted to a calf by artificial inoculation.

Single intradermal vaccination against anthrax [trans. title], T. Monod and Velu (*Bul. Soc. Cent. Méd. Vét., 101 (1925), No. 4, pp. 67–73*).—This is a discussion of the value of the method of vaccination against anthrax by a single intradermal injection (E. S. R., 51, p. 782) as demonstrated by the practical results obtained in Morocco. From the reports furnished by practicing veterinarians, it is concluded that a lasting immunity may be secured by this method even in localities in which the disease has already appeared.

A chronic infection with B. welchii, B. S. Cornell (*Jour. Infect. Diseases, 36 (1925), No. 5, pp. 425–429*).—In investigations at the University of Toronto, the author produced a chronic infection with *Bacilus welchii* in rabbits, with mild anemia, loss of weight, convulsions, and diarrhea.

Patho-anatomical and bacteriological studies of blackleg [trans. title], Wabringsholz and L. Rassfeld (*Berlin. Tierärztl. Wchnschr., 40 (1924), No. 34, pp. 449–454*).—The details of diagnoses made of 78 cases of blackleg are presented.

Melioidosis and its relation to glanders, A. T. Stanton and W. Fletcher (*Jour. Hyg. [London], 23 (1925), No. 4, pp. 347–363, pl. 1*).—This comparative study of melioidosis and glanders consists of cultural and serological studies of five strains each of *Bacillus whitmori* and *B. mallei* and animal inoculations with the two organisms.

Culturally *B. whitmori* was found to differ from *B. mallei* in that it is actively motile, forms a corrugated growth on glycerin agar, a white opaque growth on ordinary agar, and a pellicle on the surface of broth. It grows more rapidly than *B. mallei* and liquefies gelatin in a few days. Morphologically the organisms are similar. Young cultures of the mucoid form are indistinguishable and grow similarly on potato, and their action on milk and carbohydrate differs in degree only.

Serologically the 14 strains of *B. whitmori* formed a homogeneous group almost identical with 2 strains of *B. mallei*. The other 3 strains of *B. mallei* showed only a group relationship.

Mallioidosis, while primarily a disease of rodents, also occurs spontaneously in rabbits and guinea pigs and in man. Rabbits, guinea pigs ,and rats have been infected experimentally by ingestion, subcutaneous inoculation, scarification, and the application of infective material to the nasal mucosa. All attempts to infect horses have been unsuccessful.

Correlations between hemorrhagic septicemia organisms [trans. title], D. Niimi (*Jour. Japan. Soc. Vet. Sci., 3 (1924), No. 4, pp. 297–310*).—This is a contribution from the laboratory of animal pathology and bacteriology of the Tokyo Imperial University.

Complement-fixation tests on serums of cattle harboring Trypanosoma americanum, H. W. Schoening (*Amer. Jour. Trop. Med., 5 (1925), No. 3, pp. 247–249*).—Seventeen of 26 normal cattle were found by the author, through cultural tests, to be harboring *T. americanum*, a nonpathogenic trypanosome. The serums of these animals when subjected to the complement-fixation tests for trypanosomiasis all gave negative results to the test. The work has led to the conclusion that cattle harboring a nonpathogenic trypanosome do not produce antibodies detachable by complement fixation for a pathogenic trypanosome.

Tuberculin tests in cattle, with special reference to the intradermal test, S. R. Douglas et al. ([*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser., No. 94 (1925), pp. 196, pls. 2, figs. 316*).—This is a report of the tuberculin committee appointed by the Medical Research Council in 1920 and 1921 to undertake and direct investigations into the methods and results of the use of tuberculin for the diagnosis and treatment of human tuberculosis. A brief introduction (pp. 4–10) is followed by reports of investigations of a number of herds (pp. 10–58), a brief account of the modified tests, intradermal and ophthalmic, employed in the latter investigations (pp. 59–65), a Report on the Examination of Samples of Veterinary Tuberculin, by R. A. O'Brien (pp. 65–67), a precipitin method for the standardization of "old" tuberculin and the expression of results in standard units (pp. 67–75), a summary of certain of the tests (pp. 76–83), the pathological evidence (pp. 84–115), and conclusions (p. 116). A Report on Chemical Examination of the Milk of the Moundsmere Herd before and after the Tuberculin Test, by J. R. Fraser (pp. 117–127), charts illustrating the investigations of the tuberculin tests in cattle (pp. 128–194), and references to articles of the intradermal tuberculin test (pp. 195, 196) are given in appendixes. The conclusions are as follows:

"The subcutaneous tuberculin test appears to be a perfectly satisfactory test for the presence of tuberculosis in cattle when carried out under the laboratory conditions of a scientific trial. It is not a satisfactory test when carried out under ordinary farm conditions; the discrepancies then prevailing are often so numerous as to vitiate the general application of the test for practical purposes. Of the different tuberculin tests, the intradermal test as described in this report appears to be superior to the subcutaneous tests, while the ophthalmic test must be regarded as a subsidiary test.

"The intradermal test is an accurate test for the presence of tuberculosis in cattle, the percentage of error being extremely small. In support of this statement it may be mentioned that, in the committee's experience, animals diagnosed as tuberculous by the intradermal test which have not shown tuberculosis on naked eye examination post-mortem have been proved to be tuberculous by microscopic examination and inoculation of guinea pigs. The intradermal test has these further advantages over the subcutaneous tuberculin test: (1) No temperature observations are required, (2) the animal need not be kept at rest before and during the conduct of the test, (3) interference with the ordinary farm routine is not required, (4) only three observations are usually necessary, (5) a smaller quantity of tuberculin is needed for the test, and (6) the technique, although at first slightly more difficult than that of subcutaneous injection, is easily acquired.

"The variety of tuberculin employed is 'Old Tuberculin.' It appears to be immaterial whether a bovine or human strain is used in its manufacture. The tuberculin used must be of proved high potency; it is administered undiluted for both the intradermal and the ophthalmic test. In reading the ophthalmic tests when combined with the intradermal test, it appears necessary to make frequent examinations of the animal's eyes, as in every case when the reaction has been positive it has been apparent 24 hours after the second instillation."

[Work with diseases of livestock at the Wyoming Station], J. A. Hill (*Wyoming Sta. Rpt. 1924, p. 170*).—In work with avian tuberculosis it was found that cattle injected with the virus from chickens reacted to the test and developed the skin form of tuberculosis. It has been found to be possible to infect chickens with bacilli from these animals, also that, following surgical removal of the skin lesions, cattle no longer reacted to the tuberculin test.

In contagious abortion work, field tests on range cattle indicated that a living vaccine gave the best results when used on young heifers that had not previously been bred. A treatment devised for destroying *Bacillus necrophorus*, the cause of calf diphtheria, consists in the use of a 10 per cent solution of potassium permanganate in which free chlorine is present.

Vital statistics of diseases of the genital organs of cows, D. H. Udall, E. R. Cushing, and M. G. Fincher (*Cornell Vet., 15 (1925), No. 2, pp. 121–136, fig. 1*).—As a result of four years' investigations, the authors have made a compilation of 1,000 consecutive cases of genital disease in cows, which gives 307 abortions, 178 retained placentas, 139 metritis (without abortion or retained placenta), 174 sterility, 125 dystocia, and 77 miscellaneous, including torsion and prolapse of the uterus. "Laboratory examinations of 295 of the acute metritis group (abortion, retained placenta, and metritis alone) give the following results with respect to positive or negative evidence of association with *Bacterium abortum*: Abortion +96, −72; retained placenta +20, −55; metritis alone +9, −43; total +125, −170."

A contribution to the study of salmonellosis of swine [trans. title], J. Lignières (*Rec. Méd. Vét., 100 (1924), No. 22, pp. 501–518, pl. 1*).—A discussion of salmonellosis of swine due to *Bacillus suipestifer* and its relation to hog cholera (both of which occur in Argentina), including some experimental work.

A case of habronemiasis in England, F. Ware (*Jour. Compar. Path. and Ther., 37 (1924), No. 3, pp. 160–162*).—The author records details of a case in which habronemiasis in a stallion was undoubtedly contracted in England.

[Diseases of fowls studied at the Missouri Poultry Station], S. Eriksen (*In Missouri State Poultry Association Year Book, 1923. Mountain Grove, Mo., [1924], pp. 31–36, fig. 1*).—Experimental work with a remedy widely advertised for the treatment of worms in chickens has shown it to be of little value.

Repeated trials are said to indicate that nicotine sulfate, i. e., Blackleaf 40, is a very effective remedy in destroying and eradicating lice on poultry when used in the form of powder or as an ointment. Applied in the form of an ointment it may consist of 1 part of nicotine sulfate, 50 parts of vaseline, and 49 parts of tallow and lard.

A study, the details of which are presented in tabular form, shows that the presence or absence of agglutinins for bacillary white diarrhea is quite constant during periods of nonproduction as well as during the period of production.

An account is given of blindness in fowls, apparently due to iritis, which occurred during the year. This affection is known to occur in several counties of Missouri and adjoining States and in Virginia, a total of 28 specimens having been examined at the time of writing. No characteristic gross systemic lesions have been observed in infected birds, and its cause is not as yet determined.

[Poultry disease investigations at the Missouri Poultry Station], S. ERIKSEN (In *Missouri State Poultry Association Year Book and Biennial Report of the Missouri State Poultry Board for the Years 1923–1924. Mountain Grove, Mo., [1925], pp. 41–52, 58–66*).—Experiments with neoarsphenamine have shown it to be of no decided value in the treatment of blackhead in turkeys and coccidiosis in chicks. The difficulty attending intravenous administration and the expense of the drug prohibit its practical use.

In tests of certain drugs as anthelmintics, nicotine sulfate in mineral oil, given at the rate of 5 cc. of 4 per cent mixture, removed 90 per cent of the ascarids, and 1 gm. of copper sulfate removed 78 per cent. In numerous trials, 4 cc. of oil of turpentine with equal parts of olive oil yielded quite satisfactory results. Carbon tetrachloride proved of no value. Tobacco dust containing 0.1 per cent of nicotine sulfate in mash was found to be reasonably efficient.

Of 15 drugs used to purify drinking water, 5 proved very satisfactory. It is concluded that any preparation containing potassium permanganate, mercuric chloride, or chlorine compounds in sufficient quantities is useful in drinking water medication. (See also an abstract on page 669.)

An account is given of epizootic bronchitis among chickens.

A preliminary progress report on blackhead in chicks is presented. This disease is said to have been quite prevalent among chicks during the past two seasons, the symptoms and lesions being identical with those of blackhead in turkeys. Losses were usually less severe than in turkeys, varying from one or two individuals in a flock to over 50 per cent. Attempts at artificial transmission failed in 43 cases. General methods of sanitation and water medication are recommended in controlling the disease.

Diseases of the reproductive organs of the hen, B. F. KAUPP and R. S. DEARSTYNE (*Vet. Med., 20 (1925), No. 6, pp. 252–258, figs. 8*).—This is a contribution from the poultry pathological laboratories of the North Carolina Experiment Station.

Of 1,024 hens and pullets autopsied at the station during the past two years, ovarian and oviduct diseases were found in 92. A review of the literature relating to tumors in the domestic fowl is followed by a report of 4 cases studied. Tumors represent 46.7 per cent of the 92 birds showing diseases of the reproductive organs, of which 29 showed cystic ovaries, 7 hematomas, and 13 inflammation, 15 obstruction, and 8 rupture of the oviduct.

Of 1,485 birds autopsied at the station, 13 or 0.89 per cent were found to have tuberculosis. Eight showed broken eggs in the oviduct, and 5 were affected with tuberculosis of the ovary or oviduct.

The use of potassium permanganate in the drinking water for poultry, S. Eriksen (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 4, pp. 496–501*).—Investigations by the author show that potassium permanganate is very efficient as a purifier of drinking water for poultry. Organic material oxidizes it rapidly, but the change of color with oxidation makes it a self-indicator. Potassium permanganate compares favorably with other drugs, growing chicks not being injured by its use in strong dilution. When used with sour milk it does not produce harmful substances.

AGRICULTURAL ENGINEERING

Some experiments on the rating of current meters, P. Phillips (*Egypt Min. Pub. Works, Phys. Dept. Paper 14 (1924), pp. [1]+17, pls. [24]*).—A new rating apparatus used at the Abbassîya Water Works is described, by means of which three quantities to be measured are all recorded automatically, thus avoiding all errors of personal observation. It also gives a smaller number of revolutions per minute for the same velocity than other apparatus.

A comparison of discharges at the low river stage downstream of Aswan Dam and in the calibrated sluices at Aswan Dam showed that by using the old rating the discharges measured by the current meter were too low by 2.5 per cent for an average velocity of the water of 0.4 meter (1.3 ft.) per second, and by 1.7 per cent for an average velocity of 0.54 meter per second. The new rating gave values for the discharges too high by 0.27 per cent for the low stage of the Nile.

When rating a current meter suspended at different points in front of a boat, it was found that for the same velocity the number of revolutions per minute was less than when the current meter was rated in the normal way hanging from the arm of the trolley. In most positions of the current meter the difference was not large, and at a distance as great as 2 meters in front of the boat it was almost negligible, and especially so when the current meter was fairly deeply submerged.

When the current meter was suspended at various distances from the side of the same boat an increase in the number of revolutions was observed, due to the proximity of the boat. Near to the side of the boat the difference was considerable, but at a distance of 1 meter away it was small, while at 2 meters' distance no difference could be detected. Rocking the boat, so as to give an up-and-down oscillation to the current meter in addition to its horizontal velocity, increased the number of revolutions of the Gurley meter. For low velocities, this increase was very serious. The reverse effect was observed with a Haskell current meter of the propeller type.

Surface water supply of Hudson Bay and upper Mississippi River basins, 1918 (*U. S. Geol. Survey, Water-Supply Paper 475 (1921), pp. 153+XXX, pls. 2*).—This report, prepared in cooperation with the States of Minnesota, Wisconsin, Iowa, and Illinois, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1918.

Surface water supply of Missouri River basin [1918 and 1921] (*U. S. Geol. Survey, Water-Supply Papers 476 (1921), pp. 266+XLIV, pls. 2; 526 (1925), pp. VII+331, pls. 2*).—The first of these reports, prepared in cooperation with the States of Colorado, Montana, and Wyoming, presents the results of measurements of flow made on streams in this basin during the year ended September 30, 1918. The second, prepared in cooperation with the States of Montana, Wyoming, Iowa, Colorado, Kansas, and Missouri, presents the results of measurements during the year ended September 30, 1921.

Surface water supply of the South Atlantic slope and eastern Gulf of Mexico drainage basins, 1921 (*U. S. Geol. Survey, Water-Supply Paper 522* (*1925*), *pp. IV+72, pls. 2*).—This report presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1921.

Some properties of iron compounds and their relation to water clarification, L. B. MILLER (*Pub. Health Rpts.* [*U. S.*], *40* (*1925*), *No. 27, pp. 1413–1419, figs. 4*).—Studies conducted by the U. S. Public Health Service with ferric salts are reported, which showed that ferric floc possesses many of the properties of alum floc, including the same three chemical factors which determine the optimum conditions for formation. These are (1) the presence in the water of a certain minimum quantity of ferric iron, (2) the presence of an anion of strong coagulating power such as the sulfate ion, and (3) the proper adjustment of the H-ion concentration. Ferric floc differs from alum floc in that it does not redissolve at higher pH values, and less careful adjustment of pH at higher values is therefore required. The ferric floc begins to form at somewhat lower pH values than does alum floc, and it is thought that this may prove to be an advantage under certain conditions.

Studies of outlets and crops on sewage irrigated areas, G. A. MITCHELL (*Engin. News-Rec., 92* (*1924*), *No. 7, pp. 284–287, figs. 10*).—Studies conducted by the U. S. D. A. Bureau of Public Roads of sewage outlets from laterals on small institutional sewage irrigation areas are reported. The main features of the latest, and presumably permanent, type are a cast-iron outlet discharging horizontally, with the outlet and the sheet-steel uptake leading to it from the vitrified-pipe lateral protected by a cone of concrete.

Some comparative yields of crops on sewage irrigated and nonirrigated land are also included.

Public Roads, [July, 1925] (*U. S. Dept. Agr., Public Roads, 6* (*1925*), *No. 5. pp. 93–116+*[*1*], *figs. 22*).—This number of this periodical contains the status of Federal-aid highway construction as of June 30, 1925, together with the following articles: Field Methods Used in Subgrade Surveys, by A. C. Rose; Earth Pressure Against Abutment Walls Measured with Soil Pressure Cells, by J. V. McNary (see p. 684); Transportation of Milk by Motor Truck in the Chicago Dairy District, by E. L. Browne; and A Test for Determining the Amount of Shale in Sand, Using a Lead Acetate Solution, by P. M. Hegdal.

Reinforced concrete bridges, W. L. SCOTT and C. W. J. SPICER (*London: Crosby Lockwood & Son, 1925, pp. XI+207, pls. 22, figs. 116*).—This book deals with the practical design of modern reinforced concrete bridges, especially from the British viewpoint, and includes notes on temperature and shrinkage effects.

A method of studying soil stresses, M. L. NICHOLS and J. W. RANDOLPH (*Agr. Engin., 6* (*1925*), *No. 6, pp. 134, 135, figs. 3*).—In a contribution from the Alabama Experiment Station a method of studying soil stresses is described and illustrated, which seems to offer possibilities of supplying the information necessary for the design of tractor-lug equipment on a sound basis.

In this method the soil is placed in a box in uniform, evenly compressed layers. The layers are separated by sheets of very thin paper and treated to give as little resistance to shear as possible. The layers are used perpendicular to the soil surface and at right angles to a plane passing through the center of the entire rim of a lug wheel. The soil block is then placed in the testing machine, and the tractor wheel is run forward until the lug has passed through any desired amount of soil. The machine is then removed and the surface and lug imprint cast in plaster of Paris. Following this the

soil is removed one layer at a time and each successive layer cast in plaster of Paris. Thus the entire soil block is accurately cast into blocks, the surfaces of which follow the distortions produced in the sheets of delicate paper. These casts are studied and marked into contours or lines of equal distortion or pressure. The relative thicknesses of the casts at any point give a measure of the pressure at that point, and the entire soil movement is visible and in a permanent form for study.

Earth pressure against abutment walls measured with soil pressure cells, J. V. McNary (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 5, pp. 102–106, figs. 8*).—Studies are reported from which the conclusion is drawn that the pressure of earth against a retaining wall should not under ordinary conditions be assumed to be less than that which would be developed by a fluid weighing 30 lbs. per cubic foot. The tests also indicate the importance of suitable provisions for draining the fill, since it was shown definitely that a direct relation exists between the high pressures measured and a condition of high moisture content.

Resistance of materials, F. B. Seely (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1925, pp. XIII+442, figs. 314*).—This book is divided into two parts. Part one, on mechanics of materials, treats chiefly of the application of the principles of analytical mechanics and of the experimental laws of structural materials to the analysis of the action of the members used in structures and machines. Part two deals chiefly with the structural, or force-resisting, properties of engineering materials.

Minimum live loads allowable for use in design of buildings (*U. S. Dept. Com., Bur. Standards, Elimination of Waste Ser., 1925, pp. VI+38, fig. 1*).—This is the report of the Building Code Committee, presented November 1, 1924, which is divided into three parts. Part 1 explains briefly the organization of the committee and its activities; part 2 recommends minimum live loads allowable for use in the design of buildings; and part 3 is a compilation of live load data and of material not suited for incorporation in a building law, but which is explanatory of the requirements recommended in part 2 and descriptive of good practice.

The mechanics of building construction, H. Adams (*London and New York: Longmans, Green and Co., 1923, new ed., pp. XI+240, figs. 590*).—This is the second edition of this book, dealing with the engineering theory and practice of building construction.

The seasoning and preservation of timber, E. G. Blake (*London: Chapman & Hall, Ltd., 1924, pp. XII+132, pls. 22, figs. 13*).—This is a treatise on the various methods employed for drying and preserving timber against decay, and includes a chapter on the origin and spread of dry rot and the best methods for its eradication.

Heat transmission of insulating materials (*New York: Amer. Soc. Refrig. Engin., 1924, pp. III+114, figs. 50*).—This report of the insulation committee of the American Society of Refrigerating Engineers was presented at the annual meeting in 1922, and has been revised to 1924. The following articles are contained therein:

The Principles of Heat Transfer, by H. C. Dickinson; Definitions, Nomenclature, and Symbols, by E. F. Mueller; Surface Transfer of Heat, by T. S. Taylor; The Measurement of Temperature, by P. Nicholls; The Plate Method of Testing Insulating Materials, by M. S. Van Dusen; The Box Method for Determining Heat Transmission, by A. J. Wood; The Economic Value of Insulation, by J. H. Stone; Results of Tests to Determine Heat Conductivity of Various Insulating Materials, by C. H. Herter; and Problems, by H.

Harrison. An extensive bibliography, compiled by C. H. Herter et al., is included.

Big teams in Montana, M. L. Wilson and E. C. Hallman (*Mont. Agr. Col. Ext. Pub. 70 (1925), pp. 111, figs. 93*).—A large amount of practical information on the proper harnessing and hitching of big teams for different draft purposes in Montana is presented.

Some fundamentals of plow design, T. Brown (*Agr. Engin., 6 (1925), No. 6, pp. 124–129, figs. 14*).—An analytical discussion of plow design is presented, in which it is concluded that there is less chance of improving the bottom itself than the rest of the plow, and that probably the greatest opportunity for improvement of the bottom lies in further research along the line of improved materials.

Engine-starting tests, J. O. Eisinger (*Jour. Soc. Automotive Engin., 17 (1925), No. 1, pp. 52–57, figs. 18*).—Studies conducted at the U. S. Bureau of Standards on the influence of various factors on the starting of an internal-combustion engine are reported.

The results showed that, within certain limits, the richness of the mixture determines the number of revolutions that must be made before an explosion is obtained. Differences in distribution of the mixture were found to be negligible. It was shown very definitely that an advance of approximately 35° in the spark gave a much shorter starting time than one of 10°, and somewhat shorter than one of 50 or 80°. Retarding the spark beyond top-center gave even poorer results.

It was also shown that the vertical distance through which the fuel must be lifted may be important. It was found desirable to locate the carburetor jet so that the vertical distance through which the fuel must be lifted will be at a minimum.

It was found that the problem of starting in cold weather does not consist of merely getting fuel into the engine cylinder, but that the quantities of fuel required may be very different for different jacket-water temperatures. Choking was found to give somewhat better results than throttling, as it reduced the pressure throughout the intake system instead of in the manifold alone.

Best location for carbureter intake, A. H. Hoffman (*Jour. Soc. Automotive Engin., 16 (1925), No. 5, pp. 501, 502, figs. 5*).—Experiments conducted at the California Experiment Station to determine the location under the hood of a motor vehicle where the air intake of the carburetor will be exposed to the least dust are reported. The most effective type of dust screen was one of a coarse hospital gauze stretched over frames set in transverse vertical positions on either side of and above the engine.

Tests of two phaetons and a speed truck, run for less than 3 miles and following another car on a dusty road, led to the conclusion that in normal cases the best carburetor intake position is on the side of the engine on which the fan blades have a descending motion, about midway between the radiator and the dash, about midway between the side of the hood and the center line of the engine, and about one-third of the distance down from the top of the hood toward the top of the cylinder head.

Cylinder and engine lubrication, A. L. Clayden (*Jour. Soc. Automotive Engin., 17 (1925), No. 1, pp. 58–61, figs. 2*).—Laboratory tests are reported of an engine equipped with a cooling system, the object being to study the effect upon dilution of higher cylinder wall temperatures.

The results showed that a sharp reduction in dilution occurred as the boiling temperature was reached, and that the amount of dilution at temperatures of 212° F. or more was much less than would have been anticipated at lower temperatures. It is pointed out that the high cylinder temperatures reduced

dilution to a negligible quantity without introducing any apparent disadvantages. The fact that the elimination of dilution will inevitably introduce lubrication troubles due to the higher viscosity of oil which will prevail is emphasized, and various methods by which oiling systems can be modified so as to approach more nearly the ideal condition are suggested.

Rules for the construction, operation, and maintenance of electric transmission lines of 6,600 volts and less, between line conductors (*Des Moines: State, 1922, pp. 32, figs. 8*).—The text of these rules applicable to the State of Iowa is presented. Data and information are included which should be of importance in connection with studies of the application of electricity to agriculture in the State.

Method of calculating rural extensions, C. H. CHURCHILL, JR. (*Elect. World, 85 (1925), No. 11, pp. 556–558, fig. 1*).—Methods of calculating rural extensions for electric service in farming sections in New York are briefly outlined.

Standard electrical dictionary, T. O'C. SLOANE (*New York: Norman W. Henley Pub. Co., 1924, rev. and enl. ed., pp. 790, figs. 497*).—This is an encyclopedia of the science of electricity in all its phases and in its most recent developments, with definitions of terms and descriptions and illustrations of electrical appliances and connections, and a presentation of modern electrical theory, experimentation, and engineering.

Station work on the ventilation of animal shelters, R. W. TRULLINGER (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1923, pp. 89–96*).—A critical review is presented of work at the different experiment stations on the ventilation of animal shelters. It is stated that while the work conducted reflects a lack of fundamental knowledge of the subject, it seems very generally agreed that a rather fine balance must exist between temperature, humidity, air purity, and amount and rate of ventilation in livestock and poultry shelters in order to insure optimum conditions of health, comfort, and economical production in the animal or fowl. It is therefore considered important to plan and to conduct ventilation studies so as to definitely establish the proper proportion of these factors for different species of animal under different ranges of climatic conditions. Emphasis is placed on the importance of conducting such studies under absolutely controlled conditions, of beginning them with animals already in the optimum of condition, as judged by suitable standards, and of making an effort to maintain this optimum.

Allowance for variations in temperature at register faces for design of warm-air furnace systems, A. P. KRATZ (*Jour. Amer. Soc. Heating and Ventilating Engin., 31 (1925), No. 6, pp. 336–342, figs. 4*).—Studies conducted at the University of Illinois are reported which showed that the distribution of the temperature at the register faces of a warm-air furnace plant is not uniform. This unequal distribution was found to be caused by unequal temperature drops in the leaders and by the unequal distribution of the temperature of the air in the bonnet.

The distribution of the temperature of the air in the bonnet is independent of whether first, second, or third floor leaders are used at the different points, but is determined by the character of the furnace used or by the orientation of the furnace with respect to the plant. It was found in general that the temperature of the air in the bonnet tends to be highest at the rear of the furnace. In designing a properly balanced warm-air heating plant, account should therefore be taken of the variation of the temperature of the air in the bonnet as well as of the variation in the temperature drops in the several leaders.

RURAL ECONOMICS AND SOCIOLOGY

History of station work in agricultural economics, L. Marbut (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1923, pp. 83–87*).—This is a brief summary noting the emergence of agricultural from general economic science, professional organization by investigators of farm problems, and early surveys designed to determine cost of production of agricultural products. Later developments took place in the way of historical and geographical studies, investigations of land tenure, and other survey and cost accounting work.

Farm organization and management studies in Warren County, Iowa, C. W. Crickman (*Iowa Sta. Bul. 229 (1925), pp. 3–56, figs. 9*).—This study is based upon a series of surveys of farms and on census reports for Warren County from 1850 to 1920, inclusive. The first survey of 832 farms was made in the summer of 1916 for the farm year beginning March 1, 1915. Three years later, during the summer of 1919, a similar survey was made on 177 farms for the year beginning March 1, 1918. A third survey was taken during the summer of 1922 on 231 farms for the year beginning March 1, 1921. The surveys of 1918 and 1921 covered practically the same area surveyed in 1915, and many of the same farms were studied each year.

In 1921 the various crops together occupied 59 per cent of the farm land and pasture 37 per cent. Of the land in crops, 45 per cent was in corn, about 30 per cent in small grain, and the remainder in hay. Hogs comprised the most important class of livestock. Less than 20 per cent of the gross income from these farms in 1921 came from crops. Practically 25 per cent was realized from this source, however, in 1918 and 1915. About one-third of the total income came from hogs in 1921.

The three outstanding items of cash expenditure in 1921—taxes, purchased feed, and hired labor—constituted 17, 14, and 12 per cent, respectively, of the total chargeable expense. This included, besides the cash outlay, depreciation on buildings, livestock, and machinery.

The most profitable cropping system for this area is thought to be one with as little pasture as the soil and surface conditions of the farm permit and as much corn as can be produced without reducing yields. Wheat is the most profitable small grain crop. Most of the corn crop is utilized in feeding hogs, although there is some cattle feeding on the larger farms, and many of the farmers combine a limited amount of dairy production with the general cattle enterprise.

Iowa farm costs and incomes in 1923 (*Des Moines: Iowa Farm Bur. Fed., [1924], pp. 14*).—This is a report on work conducted by the Iowa Farm Bureau Federation and the Iowa Experiment Station. It shows general financial statements, losses and gains, unit costs of important products, operating costs per acre for corn and oats, and man labor, horse, and tractor costs per hour on the basis of cost accounts kept each year since 1920 on about 20 farms in Marshall County, Iowa, and since 1921 on about the same number in Shelby County.

Adjusting farm production in Cheshire County, N. H., to market demands, H. I. Richards and H. A. Rollins (*New Hampshire Sta. Bul. 217 (1925), pp. 55, figs. 18*).—Data with respect to the present production, sales, and methods of marketing farm products were obtained on 182 farms in this county chosen as typical of changes that are taking place in agricultural production through a large part of the State and New England. The number of farms is decreasing, together with agricultural production, and transportation

costs on food commodities received are increasing. An analysis was also made of railroad and highway receipts and shipments in order to determine the size of the local market and the extent to which Cheshire County farmers are supplying local demands for farm products. The first part of this report covers the characteristics of the consuming population, industrial development, and other trends of growth and demand. The second part takes up the general agricultural situation and then deals with the specific agricultural enterprises that seem to present the greatest opportunity.

Except for its supply of whole milk, apples, bush fruits, and sweet corn, the county does not feed itself. Employment in industries constitutes an important source of income. Dairy is the basis of farming. The average feed cost of producing milk on 40 farms with five or more cows per farm was $1.49 per 100 lbs., or 60 per cent of the average price received at the cooperative milk plants. Plantings of permanent apple trees are encouraged on favorable sites, as is also timber production. An expansion in the total acreage of vegetables is held to be not advisable, although it is thought that commercial potato production with machinery on 10 or more acres should prove profitable.

Farm profits and farm losses, A. G. Ruston (*Scot. Jour. Agr., 6 (1923), No. 3, pp. 287–296*).—The department of agriculture at the University of Leeds has had 52 farms of various types under investigation. On those farms for which accounts for the year 1921–22 had been completed, there was an average net loss of £2 10s. 6d. per acre, a loss equivalent to 16 per cent of the capital invested, or 1.82 times the rental. Some of the accounts for corn and potatoes, as well as for cattle, milk, sheep, pigs, and poultry, are interpreted here.

Standards of production and net output on Scottish farms, A. W. Ashby (*Scot. Jour. Agr., 6 (1923), No. 4, pp. 387–401*).—The rate of wages per person which it is possible to pay, the total amount of labor per 100 acres of land for which employment is provided, and the rent a property will yield are regarded as three tests of the standard of production for any agricultural system. The financial results from 56 Scottish farms previously noted (E. S. R., 50, p. 191) are analyzed as showing how it is possible to ascertain the net output per unit of land, labor, and capital. It is held that the order of merit of different given combinations of the factors may be judged from the point of view of any one of several standards, including the gross output per acre of land, the net output per man, the gross return on the farmer's capital, the gross wages paid, and the most economical use of land, labor, and capital, but that the only standard at once comprehensive and generally useful is the amount of net output per unit of the combined factors.

Iwerne Minister Home Farm: Cost accounts for three years, A. Bridges (*Oxford: Univ. Press, 1924, pp. 52*).—The financial records kept on a farm of 1,318 acres in Dorset County, England, up to September 29, 1923, are discussed under the heads of the several separate livestock and crops accounts.

Motorizing the corn crop in Ohio, G. W. McCuen (*Agr. Engin., 5 (1924), No. 12, pp. 268–270, figs. 2*).—In a contribution from the Ohio State University a study is briefly reported on the question of saving man-hours of labor or of increasing the labor output per man with reference to corn production. A direct comparative study was therefore made of horse and motor equipment in the same field under the same conditions. The data indicate an average saving of 0.95 man-hour per acre by the use of motor power over horsepower. It was further indicated that in final cultivations a man can cover 50 per cent more acreage a day with a motor cultivator than can be covered with horse-drawn equipment.

The tractor on Ohio farms, F. L. Morison (*Ohio Sta. Bul. 383 (1925), pp. 30, fig. 1*).—A survey study begun during 1919 was continued for five years. In the

first year 102 farmers were visited, and a record was taken of their business for the previous year. Up to April, 1923, a total of 326 yearly records had been obtained.

The tractors included in this survey were being used an average of 256 hours per year. They were estimated to have a total life of 1,794 hours, or on the basis of the amount received for tractors disposed of, a working life of 1,703 hours. The average hourly cost of operating 2-plow tractors was estimated at $0.93 and of 3-plow tractors $1.41. The use of a tractor was found to have brought about a reduction of 1.3 work horses per farm in western Ohio and 1 work horse per farm in eastern Ohio. A reduction in the amount of feed fed to each remaining work horse was also possible. In western Ohio there was an actual reduction in the combined cost of power and labor per crop acre following the purchase of tractors.

Place of tenancy in a system of farm land tenure, G. S. WEHRWEIN (*Jour. Land and Pub. Utility Econ., 1 (1925), No. 1, pp. 71–82*).—The author presents a discussion first of the human element in farm tenancy, particularly in the South where the presence of the negro and the white cropper gives rise to special problems, and then of the four types of tenure which serve as steps by which men advance to farm ownership, as the farm laborer who works for wages and has little capital or property; the tenant, strictly speaking, who owns most or all of the equipment and work animals required to operate a farm; the mortgaged owner; and the debt-free owner operator. The real tenant problem is said to exist with reference to the permanent tenant class, in the case of whom the abolition of tenancy would, however, avail nothing. The importance of a study of the function of the landlord is urged.

Seasonal distribution of employment in agriculture, J. S. KING (*Jour. Min. Agr.* [*Gt. Brit.*], *31 (1925), No. 10, pp. 916–925, pls. 3*).—The hours of labor required for the several classes of livestock and the different crops on three farms in the east midland area of England are graphically represented, week by week, for a calendar year. The first graph applies to a farm under intensive cropping to market garden produce and producing market milk. The data are given for the year May, 1922, to April, 1923. The second case is that of a farm on which the livestock require a steady and regular volume of employment. The period shown is from October, 1922, to September, 1923. The third is that of a dairy farm which is largely under grass, and the labor required between April, 1923, and March, 1924, inclusive, is shown.

Farm wages and working hours in Scotland in summer 1923, J. WILSON (*Scot. Jour. Agr., 6 (1923), No. 4, pp. 446–456*).—Estimates of the wages and working hours of married and single plowmen and women workers are given by counties, continuing a report previously noted (E. S. R., 48, p. 596.)

Farm-mortgage interest rates, C. F. WIGDER (*Jour. Land and Pub. Utility Econ., 1 (1925), No. 1, pp. 102–117, figs. 6*).—This article is concerned with the physical, economic, agricultural, and social characteristics of 15 homogeneous areas in the United States, which tend to explain farm mortgage interest rates therein. The most important correlation with farm mortgage interest rates is said to be their inverse relationship to land values. Physical factors affecting these land values are noted, but emphasis is placed upon economic conditions affecting mortgage rates principally in the way of local surplus funds available as a result of the type of farming, legislation, and taxation.

The exchange value of permanent plantings [trans. title], A. A. SCHUBERT (*Landw. Jahrb., 60 (1924), No. 5, pp. 545–583*).—The damage inflicted upon German plantings in the Tropics, particularly of cacao and rubber, during the war having given rise to suits and conflicting interpretations of valuation and

compensation regulations, the author endeavors to work out formulas for estimating values in order to facilitate the adjustment of losses.

The difference between gross and net clear income, between income and profit, and between profit and clear profit is defined and expressed by means of equations. It is then pointed out that the capitalized income should preferably be based upon the net clear income, because the latter is defined to make allowance for a deduction from the gross income of an amount designed for capital replacement. A critical earning period is discussed as the maximum number of years during which an expected income from a property may be deferred and yet continue to be a factor in determining the exchange value of the property. The "Gemeine Wert," or exchange value, is expressed by the formula

$$T = \frac{1}{2}[A + (b - \phi T)f]$$

in which A represents the capital outlay, b the gross clear income, or the total income less ordinary costs not including sinking fund, ϕ the rate used in arriving at the amount to be set aside as sinking fund, and f the factor by which the net clear income is multiplied in order to convert it into yield value.

Harvesting and packing grapes in California, H. E. JACOB and J. R. HERMAN (*California Sta. Bul. 390 (1925), pp. 3–44, figs. 24*).—Practices in handling, packing, and shipping table grapes are described in detail and illustrated, particularly for the information of the grower.

Marketing onions, A. E. CANCE and G. B. FISKE (*U. S. Dept. Agr. Bul. 1325 (1925), pp. 71, figs. 36*).—Commercial onion production is set forth here by describing classes and types grown, the principal growing regions, and methods of financing, harvesting, grading and packing, local selling, storage, transportation, and distribution through wholesale markets. Maps and other graphic illustrations and photographs are used throughout in dealing with these topics, prices, costs of marketing, and other items. Statistics principally of unloads, shipments, prices, and imports and exports are added, together with a list of State and other bulletins and circulars on this subject.

The marketing of milk in the Chicago dairy district, H. A. ROSS (*Illinois Sta. Bul. 269 (1925), pp. 461–540, figs. 16*).—In an investigation of the milk supply situation for Chicago and thereby of certain fundamental facts underlying milk marketing, data were obtained by sending questionnaires to all the milk dealers in Chicago and taking detailed data directly from the books of a few dealers. This study was carried out principally between October, 1922, and September, 1923, inclusive.

This bulletin describes significant conditions surrounding the Chicago milk market, production and consumption being first studied separately. Records were obtained from retail routes showing the average daily sale of milk to 7,743 families in one of the better residential districts and to 8,511 families in a district where the incomes are smaller, being derived largely from clerical and factory employment. In the poorer district the sales were almost 20 per cent greater, or 1.96 pints per family. Further, for purposes of comparison the city was divided into sections representing (1) a district of comfortable homes on moderately large incomes, (2) a region of high rentals and high property values, including many apartment hotels, (3) a section with a mixed native and foreign population, (4) the negro district with a part of the foreign district and a small corner of the better-class white section, and (5) the south-side residential district. The consumption of dairy products in these districts is shown in considerable detail. Consumption is then analyzed from the points of view of long-time trend, seasonal variation, variation by days of the week, effect of temperature, and effect of price changes. The problem of the amount and utilization of surplus milk is discussed, and a brief comparison is drawn of the Chicago milk prices and prices of milk in the regions producing a sur-

The grain trade, A. E. Reynolds (*Toledo, Ohio: Grain Dealers Natl. Assoc., 1925, pp. 32*).—In this brief, presented to the President's Agricultural Commission by the Grain Dealers National Association, 33 investigations of the grain trade by Federal and State Governments and by foreign Governments between 1890 and 1924 are cited, and the findings are summarized. It is pointed out that three important steps affecting the grain trade have been taken with reference to inspection and grading, the supervision of future trading, and speculation and tariff increases. The position of cooperative marketing of grain or other staple nonperishable crops is held to be largely untenable. Farmers' organizations based on the principle of self-help are the most likely to survive.

Cooperative marketing finance, J. M. Chapman (*Polit. Sci. Quart., 39 (1924), No. 4, pp. 592–623*).—This is a discussion primarily of the method of financing the commodity or California type of cooperative association, setting forth marketing agreements, financing the members of the associations, advancing funds to the growers, and the available plans of financing the associations themselves.

California crop report for 1923, E. E. Kaufman, R. E. Blair, and N. I. Nielsen (*Calif. Dept. Agr. Spec. Pub. 43 (1924), pp. 31*).—This is an annual summary of statistics of crops and livestock for California issued cooperatively by the State and the U. S. Department of Agriculture.

Crops and Markets, [July, 1925] (*U. S. Dept. Agr., Crops and Markets, 4 (1925), Nos. 1, pp. 16; 2, pp. 17–32; 3, pp. 33–48; 4, pp. 49–64*).—The usual current weekly summaries of market information with respect to the principal classes of agricultural commodities are presented in these numbers, with tabulated summaries comparing receipts, shipments, prices, and other market information over longer periods and with comparisons. A brief series of index numbers of agricultural exports for May, 1925, with comparisons, is found in No. 1.

Monthly Supplement to Crops and Markets, [July, 1925] (*U. S. Dept. Agr., Crops and Markets, 2 (1925), Sup. 7, pp. 201–240, figs. 3*).—The results of the June 1, 1925, pig survey are tabulated, and a brief review of the general price and demand situation with regard to hogs for July, 1925, is presented. A summary of investigations of wage rates of men on farms throughout the United States beginning with 1866 and extending to July, 1925; a survey of tobacco acreage, production, and value by types for 1923 and 1924, with preliminary estimates of acreage for 1925; and a revision of price-index data previously noted (E. S. R., 51, p. 895) are featured in this number. The dairy products and oleomargarine manufactured in 1924 are tabulated by months and by States. The cotton report for June, the usual current crop report, and others, including estimated prices of farm products received by producers, receipts and disposition of livestock at public stockyards, and shipments of fruits and vegetables, are given.

Stabilizing agricultural prices, J. A. Estey (*Jour. Polit. Econ., 33 (1925), No. 1, pp. 81–93*).—Price stabilization is held to be dependent on control over the supply, which in agricultural production is subject to the effect of natural conditions and the existence of a large number of scattered individualistic producers. Three methods of reducing the supply are pointed out as destruction of the product, the dumping of the surplus abroad, and putting it in storage or reserve. Problems associated with each device are discussed.

The problem of agriculture, R. G. Tugwell (*Polit. Sci. Quart., 39 (1924), No. 4, pp. 549–591, figs. 5*).—The author outlines a series of periodical depressions of agriculture and accounts for the rapidity of price movements. He then examines critically a number of [illegible]

arisen in recent years, noting the work of the Joint Commission of Inquiry and the National Agricultural Conference of 1922 and discusses the McNary-Haugen bill.

Credit aspects of the agricultural depression, 1920–21, I–II, C. L. BENNER (*Jour. Polit. Econ., 33 (1925), Nos. 1, pp. 94–106; 2, pp. 217–233*).—An account is given of the increase in farmers' indebtedness between 1914 and 1920, primarily for purposes of production but also for land speculation and bogus stock subscriptions. The conditions which brought about the depression in the cattle and wheat industries are set forth.

The author traces Federal reserve bank policy in the period immediately following the war, holding that the drop in agricultural prices has been proved not to have been caused by the restriction of credit on the part of the Federal reserve banks but rather that the rapid decline of agricultural prices was the fundamental cause of credit stringency. Farmers are thought to have confused their credit problem with their price problem.

Living conditions and family living in farm homes of Schoharie County, New York, E. L. KIRKPATRICK and J. A. DICKEY (*U. S. Dept. Agr., Bur. Agr. Econ., 1925, pp. 22*).—The partial results of a study of farm homes in the southern part of Schoharie County, N. Y., are given in this mimeographed preliminary report. The authors used the schedules returned by 498 families in analyzing the value of all goods used during the year ended September 30, 1924, classifying and comparing these values, and suggesting ways of using such goods as a guide to rational family living in farm homes. Data regarding the use of time by the homemaker and operator are also given.

Farm workers' budgets, I–IV, A. W. ASHBY (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 9, pp. 812–821; 31 (1925), Nos. 10, pp. 902–911; 11, pp. 996–999*).—Out of a number of budgets obtained in March, 1924, 49 were tabulated in two groups, including 40 which gave particulars as to the make-up of the families and 9 for which such details were not given. Another inquiry was carried out a few months later and included 43 families, 25 of which contained not more than 3 children and 18 more than 3.

The 33 families which made complete returns as to expenditures averaged 6s. 10d. per month and showed a balance of about 2s. 3.5d. for the purchase of new clothing, utensils, etc. It was evident that the provision of new clothes depended largely upon extra earnings, mainly in the harvest seasons, and this is said to correspond with what is known of the customs of farm workers' families. The items of weekly expenditure as shown in the two sets of budgets are compared.

Our rural heritage, J. M. WILLIAMS (*New York: Alfred A. Knopf, 1925, pp. XVII+246*).—This is a study in rural social psychology, analyzing the behavior of rural people in terms of their attitudes to the weather, family and kinship relations, and economic, social, religious, educational, intellectual, juristic, and political attitudes. The development of a rural psychology in the United States is traced through stages designated as the acquisitive characterized by rigid adherence to custom, the assertive influenced by the settlement westward and freedom from earlier restraints, and the last in which attention has been directed toward cooperative endeavor. Throughout, the author draws upon his detailed knowledge of a certain community in New York State.

An agricultural survey of central Georgia, M. C. GAY and H. T. CROSBY (*Ga. Agr. Col. Bul. 304 (1925), pp. 68, figs. 25*).—Eight counties in the vicinity of Macon, Ga., were made the subject of a study by the Georgia State College, the Macon Chamber of Commerce, and the U. S. Department of Agriculture.

General descriptive information was supplied by crop-reporting services and local agencies. A business analysis was made of 20 representative farms in each of the counties.

Intensive dairying in New Zealand and Wisconsin, H. L. Russell and T. Macklin (*Wisconsin Sta. Bul. 377 (1925), pp. 3–40, figs. 20*).—Some preliminary notes are presented following a cooperative study of the dairy industry of New Zealand, in which the bearing of that development upon the cooperative dairy enterprises of Wisconsin was particularly kept in mind.

The rebuilding of rural England, M. Fordham (*London: Hutchinson & Co., 1924, pp. XIII+212, pl. 1*).—After a brief survey of English rural history, the author discusses landholding, business methods, rural finance, and rural psychology and then outlines a plan of rural reconstruction contingent upon the redistribution of the land and its administration in such a way as to provide productive employment for more laborers.

Information regarding Argentina [trans. title], R. Medina (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 250 (1924), pp. 154, pls. 3, figs. 51*).—This is a handbook of compiled statistics, with descriptive notes, setting forth agricultural possibilities and opportunities for immigration and land settlement.

Report of the Minister of Agriculture [of Argentina] for 1923 [trans. title], T. A. Le Breton (*Min. Agr. Argentina, Mem. Cong. Nac., 1923, pp. 285, pls. 11, figs. 46*).—The reorganization of the agricultural statistical service and governmental crop estimating agencies in Argentina is set forth, and tabulations, together with graphic representations of statistics for recent years, are given. Other sections of the report cover the miscellaneous activities of the Ministry of Agriculture in the aid of agriculture, agricultural education, livestock sanitary inspection, livestock improvement, and colonization and immigration.

The census of Brazil of September 1, 1920.—II, Agriculture and industries of the Federal District, B. Carvalhoz (*Recenseamento do Brazil Realizado em 1 de Setembro de 1920.—II, Agricultura e Industrias, Districto Federal. Rio de Janeiro: Min. Agr., Indus. e Com., Dir. Geral Estatis., 1924, pp. CVI+192, pls. 37*).—Returns from the census previously noted (E. S. R., 50, p. 894) are presented, pertaining to the agriculture and industries of the district in which the city of Rio de Janeiro is situated.

Statistical annual of the Republic of Chile.—VII, Agriculture, 1922–23 [trans. title] (*An. Estadis. Chile, 1922–23, Sect. VII, pp. [4]+140*).—Annual statistics of crop area and production and numbers of livestock are presented in continuation of the series previously noted (E. S. R., 52, p. 95).

AGRICULTURAL EDUCATION

General science, W. H. Snyder (*New York: Allyn and Bacon, 1925, pp. XVIII+591+17, pl. 1, figs. [470]*).—This is a simple textbook abundantly illustrated with photographs and diagrams. Numerous laboratory experiments are suggested, and questions are drawn up for each chapter.

The science of everyday life, E. F. Van Buskirk and E. L. Smith (*New York: Houghton Mifflin Co., 1925, rev. and enl. ed., pp. XIV+498, pls. 2, figs. 240*).—In this textbook in general science, designed especially for junior high schools, the subject matter is organized under the major topics of air, water, food, protection, and the work of the world. Problems are suggested and annotated bibliographies are drawn up.

An introduction to economic geography, W. D. JONES and D. S. WHITTLESEY (*Chicago: Univ. Chicago Press, 1925, vol. 1, pp. XXXVII+375, pls. [251], fig. 1*).—This is a textbook for college or late high school courses. Volume 1 deals with the natural environment in its bearing on man's economic life. Part 1 of this volume suggests exercises in the study of climate and natural vegetation, land forms and soil, bedrock and mineral deposits, ground and surface waters of the lands, oceans and their coasts, and shape, size, and location as elements of the natural environment. Part 2 consists of textual materials, and part 3 of graphic and photographic illustrations.

The book of plants, B. M. PARKER and H. C. COWLES (*Boston: Houghton Mifflin Co., 1925, pp. VI+252, figs. 100*).—This is designed to provide silent reading material for children of the upper elementary school grades.

Outlines of agricultural economics, H. C. TAYLOR (*New York: Macmillan Co., 1925, rev. and enl. ed., pp. XII+610, figs. 68*).—In this revision of a textbook previously noted (E. S. R., 42, p. 789), the subjects of marketing farm products and agricultural cooperation have been enlarged. Chapters on farm management have been rewritten, and chapters have been added on the subjects of insurance and the future of the farmer. Recent work in the way of perfecting market information and crop estimates and forecasts is described.

Readings in marketing, F. E. CLARK (*New York: Macmillan Co., 1924, pp. XX+705, figs. 15*).—This volume is designed to provide descriptive and supplementary material for use in the study of commodity marketing, following the general outline of a text previously noted (E. S. R., 48, p. 788). The chapters dealing directly or indirectly with agricultural marketing are marketing farm products, the wholesaling of farm products, middlemen of the agricultural wholesale market, marketing raw materials, distributive cooperation, the elimination of middlemen, physical distribution, market finance, market risk, market news, standardization, market price, the relation of the State to marketing, the elements of marketing efficiency, and the cost of marketing.

How to know textiles, C. P. SMALL (*New York and London: Ginn and Co., 1925, pp. XXIII+374, figs. 240*).—This is designed primarily as a textbook in textiles for high school and university students. It covers the numerous types of textile fabrics and gives descriptions of raw materials and of manufacturing processes. Questions are suggested and references are cited for each chapter.

Everyman's house, C. B. CRANE (*Garden City, N. Y.: Doubleday, Page & Co., 1925, pp. XIV+226, pls. 8, figs. 9*).—This is a popular account of the building, arrangement, and use of the small model house in Kalamazoo, Mich., which was awarded first prize in a recent nation-wide better-homes demonstration.

A home of your own, D. T. LUTES (*Indianapolis: Bobbs-Merrill Co., 1925, pp. [6]+424, pls. 32*).—Home building, furnishing, management, and care are considered in 33 chapters. Questions intended to emphasize the application of the suggestions offered are drawn up for each chapter, and a bibliography of books on homemaking is included.

That kitchen, R. K. WILLARD (*N. Dak. Agr. Col. Ext. Circ. 63 (1924), pp. 18, figs. 7*).—General principles to be observed in planning a new kitchen or rearranging an old one are set forth.

Preservation of foods, L. V. WALKER and H. L. HUGHES (*Va. Agr. Col. Ext. Bul. 79 (1924), pp. 62, figs. 8*).—Canning recipes and time tables and charts showing proportions and procedure in preparing preserves, jellies, and conserves are offered in this handbook for canning club members.

Food study club work (*Mich. Agr. Col. Ext. Club Bul. 15 (1924), pp. 55, figs. 21*).—The material presented here is brought together for the purpose of

teaching club members the function of cereals, fruits, vegetables, eggs, and milk in the diet, suggesting experiments, demonstrations, leading questions for discussion, and acceptable ways of preparing notebooks.

Teaching child care to girls of high-school age, A. Thompson (*Jour. Home Econ., 17 (1925), No. 7, pp. 397, 398*).—An outline prepared for use in high schools and in special classes for over-age girls, and having special reference to the possible social values in a course in child care, is published here.

Extension work in agronomy, 1923, O. S. Fisher (*U. S. Dept. Agr., Dept. Circ. 343 (1925), pp. 15, figs. 8*).—Extension work with respect to crop, seed, and soil improvement is reported upon, and a brief statistical summary of activities and results is given.

Extension work with fruits, vegetables, and ornamentals, 1923, C. P. Close, W. R. Beattie, and F. L. Mulford (*U. S. Dept. Agr., Dept. Circ. 346 (1925), pp. 16, figs. 6*).—The outstanding problems dealt with by extension workers were pruning, spraying, and fertilizing in connection with commercial and home fruit production, finding dependable sources of seed, maintaining soil fertility, controlling insects and diseases, and preparing vegetables for market, and the improvement of home surroundings. Success with these and secondary problems is reported upon here, setting forth methods, the use of illustrative materials, and the organization of farmers for demonstrations.

Farm-forestry extension: Early development, and status in 1923, G. H. Collingwood (*U. S. Dept. Agr., Dept. Circ. 345 (1925), pp. 15, figs. 7*).—Teaching and general aid to farm woodlot owners as well as the encouragement of forest planting on idle lands, white pine blister rust control, and forestry work with farm boys and girls constitute the extension program in farm forestry as reported upon here.

The grain judging club (*Missouri Agr. Col. Ext., Boys' and Girls' Club Circ. 14 (1924), pp. 31, figs. 10*).—Programs for meetings are suggested, the principal subjects for consideration at which are outlined as club organization, the collection of plant and seed specimens, identification of varieties and judging of the principal grain crops, making germination tests, demonstrations for individuals and teams, and the local achievement program.

Grain sorghums club work, G. R. Quesenberry (*N. Mex. Agr. Col. Ext. Circ. 84 (1925), pp. 23, figs. 10*).—Directions are given for growing grain sorghums as a boys' and girls' field crops project for New Mexico, and a score card is drawn up for use in judging the product.

Suggestion for constitution and by-laws for community clubs (In *Missouri State Poultry Association Year Book, 1923. Mountain Grove, Mo., [1924], pp. 62–64*).—These are drawn up for junior poultry clubs.

The local poultry show (In *Missouri State Poultry Association Year Book, 1923. Mountain Grove, Mo., [1924], pp. 41–59*).—A poultry association and poultry shows are deemed important to the poultry industry, and suggestions are drawn up here for financing and managing a local show. A constitution and by-laws for county poultry associations are also shown.

Report on the activity of the agricultural organizations in plant production in Zealand, 1924 [trans. title], L. Rasmussen (*Beret. Landbofor. Virks. Planteavl. Sjaelland, 1924, pp. 310*).—This report, compiled by the plant production committee of the cooperating agricultural organizations on the island of Zealand, Denmark, summarizes the activities of the different organizations, including cooperative fertilizer and crop tests, cultural demonstrations, grass culture tests, distribution of seed and seed potatoes, and contests in crop production, farm management, and farm accounting.

MISCELLANEOUS

Work and expenditures of the agricultural experiment stations, 1923, E. W. Allen, W. H. Beal, E. R. Flint, et al. (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1923, pp. 122*).—This report contains a discussion of the activities of the stations during the fiscal year ended June 30, 1923, noted editorially (E. S. R., 53, p. 301); a résumé entitled Some Results of Station Work; three special articles noted elsewhere in this issue; a list classified by subjects of the publications of the stations received during the year; and Statistics of the Stations, by J. I. Schulte.

Thirty-fourth Annual Report of [Wyoming Station, 1924], J. A. Hill (*Wyoming Sta. Rpt. 1924, pp. 161–176*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, a report of the director on the work of the station, and meteorological observations by F. E. Hepner (see p. 615). The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Connecticut State Station.—At the recent session of the general assembly provision was made for the construction of a new greenhouse to be devoted chiefly to investigations in soils.

William Veitch, superintendent of buildings and grounds for 23 years, has resigned and has been succeeded by George E. Graham. Drs. Willis R. Hunt and Paul C. Mangelsdorf have been appointed scientific assistants in botany and plant breeding, respectively. Dr. W. E. Britton, entomologist of the station and State entomologist, has also been appointed superintendent of the State Geological and Natural History Survey vice the late Dr. Henry Hollister Robinson.

Purdue University and Station.—A new horticultural building is being constructed, three stories in height and of pressed brick and reinforced concrete. It will contain classrooms and offices for the department, storage, laboratories, and an $8,000 refrigeration plant, where extensive investigations with fruits and vegetables may be carried on.

An addition to the station annex is nearing completion.

At a recent meeting of the board of trustees, Hon. Fred S. Purnell was given an honorary appointment as lecturer on agricultural legislation. This action was taken in recognition of the services rendered by Mr. Purnell in the passage of the Purnell Act.

Maine University and Station.—Charles H. Merchant, professor of agricultural economics and farm management in the College of Agriculture, has been appointed head of agricultural economics in the station.

Cornell University and Station.—The laboratories and shops of the department of rural engineering have been moved to a position nearly a half mile from their original location, to make room for the new building program of the College of Agriculture. The rural engineering laboratories will have approximately 50 per cent more space than formerly.

Four new greenhouses, being erected for the use of the vegetable gardening and floriculture departments, are nearing completion.

The resignations are noted of E. F. Guba as assistant extension professor in plant pathology, to become assistant research professor of botany in the Massachusetts Station; H. A. Stevenson as supervisor of home study courses, to accept a position with a publishing firm issuing agricultural textbooks; N. D. Steve, assistant extension professor in rural engineering, to engage in commercial work; and I. C. Hall, professor of bacteriology, to head the bacteriological department in the School of Medicine of the University of Colorado. Leaves of absence of several months' duration have been given to W. J. Wright, L. A. Maynard, W. I. Myers, C. R. Crosby, H. W. Riley, H. E. Ross, Doris Schumaker, Flora M. Thurston, Mrs. Ruby G. Smith, S. Lucile Brewer, and C. H. Myers. At the request of the Government of Argentina, H. E. Ross, professor of dairy industry, is conducting an investigation of the dairy industry of that country.

Dr. Edwin F. Hopkins has been appointed assistant professor of botany.

New York State Station.—Contrary to the general belief of fruit growers that the Baldwin apple is undergoing a change of type in different localities, the station experiments in progress since 1911 indicate that if there are new strains of this variety they can not be attributed to a changed environment. Eighty-four Baldwin apple trees purchased 14 years ago from 40 different locations in the United States are now in full bearing and all produce fruit similar in size, color, season, and quality.

Pollination tests made during the past summer in the Hudson River Valley show that the J. H. Hale peach will not set fruit to its own pollen, but that Elberta and other standard varieties make excellent pollinators for this sort. Out of 231 self-pollinated J. H. Hale blossoms under 31 different bags not a single peach developed. Belle of Georgia gave 33.3 per cent set, Carman 28.5, Champion 37.5, Elberta 35.8, Hiley 30.7, and Rochester 36.1 per cent.

A feature of the station dairy exhibit at the State Fair at Syracuse in September was a cheese-testing demonstration. This demonstration consisted of the distribution of samples of loaf cheese and of ordinary American Cheddar cheese for comparison by the public, and also of samples of a good cream cheese and of cottage cheese.

Low temperatures at time of dusting, lack of foliage to hold the dust, and insufficient material are given as the principal causes of failure to secure satisfactory control of apple aphids in New York orchards in a report on experiments on insect control made by the station entomologists during the past year. Tests are said to show definitely that aphids can be controlled with nicotine dust provided the material is applied a little later in the season than is generally done and provided sufficient material is used.

Ohio State University and Station.—A new university poultry plant on a 40-acre tract recently acquired is to be constructed, a State appropriation of $40,000 being available.

R. B. Tom has been appointed extension instructor in rural sociology, beginning August 1, and will devote full time to the fostering of organized recreation in rural communities, especially to the presentation of suitable dramatic entertainments.

At the station a new $35,000 beef cattle and sheep barn is nearing completion. Plans are being drawn for an animal industry building, fruit storage building, and sewage disposal plant authorized at the last session of the general assembly.

The special field days at the station this year were decidedly successful. At the first annual vocational agriculture day there were present 795 students, 75 instructors, and 110 other persons. After the livestock day at the station 7 carloads of experimental cattle and hogs were shown in city stockyards in three other sections of the State, and the total attendance at these meetings was 8,000. The attendance on poultry day was 1,500, wheat field day 1,000, and horticultural day 800. Twenty county and several other groups also chose special days to study different phases of the station work.

On September 1, R. M. Salter was appointed chief of the reorganized department of agronomy, which includes the former departments of agronomy, chemistry, and soils. Former Director C. E. Thorne, J. W. Ames, F. A. Welton, L. E. Thatcher, J. B. Park, F. E. Bear, and G. W. Conrey are associates in the new department.

Dr. J. I. Falconer has been appointed chief and C. G. McBride, C. E. Lively, G. F. Henning, F. L. Morison, and J. F. Dowler assistants in the new department of rural economics. R. W. Gerdel has been appointed assistant in agronomy and Donald Comin assistant in horticulture.

Tennessee Station.—Recent appointments include Dr. Margaret B. MacDonald as biochemist, Miss Esther M. Crawford as assistant biochemist, M. B. Sanders as assistant chemist vice R. M. Barnette, and J. O. Andes as assistant plant pathologist.

Utah College and Station.—The following members of the staff have returned after a year or more elsewhere: H. J. Frederick, professor of veterinary science, who returns from study in Europe; O. W. Israelsen, professor of irrigation and drainage, who was granted the Ph. D. degree at the University of California last spring; George Stewart, professor of agronomy, who has returned from a year's study at the University of Minnesota; Herbert J. Pack, associate professor of zoology and entomology, who received the Ph. D. degree at Cornell University last spring; and Ezra G. Carter, assistant professor of bacteriology and physiology, who returns from the University of Michigan with the degree of Doctor of Public Health.

Among recent appointments are the following: Kenneth C. Ikeler, professor of animal husbandry; John O. Ellsworth, associate professor of agricultural economics; Alma Esplin, assistant professor of wool management and assistant animal husbandman in the station; Wilford C. Cole, instructor in dairy manufacturing and manager of the creamery; John W. Carlson, superintendent of the Alfalfa-Seed Experiment Farm; and P. V. Cardon, station publicity man in charge of research in the cost of crop production studies for long-time periods. Dr. E. C. Branson, professor of rural economics and sociology in the University of North Carolina, is to offer courses during the fall quarter.

Virginia Station.—E. L. Langsford has been appointed assistant agricultural economist, effective July 1, and W. G. Nunn, assistant agricultural engineer, effective August 1.

International Congress of Plant Sciences.—This congress, which will constitute the Fourth International Botanical Congress, will be held at Ithaca, N. Y., from August 16 to 23, 1926. Its work is announced as "primarily with problems of fundamental research and teaching," but with opportunity for the discussion of regulatory recommendations of international importance. It will be organized into sections of agronomy; bacteriology; cytology; morphology, histology, and paleobotany; ecology; forestry; genetics; horticulture; physiology; pathology; pharmacognosy and pharmaceutical botany; taxonomy; and mycology. In addition to the formal programs, participation in which will be by invitation, round tables are contemplated in each section, as well as exhibits, excursions, inspection tours, etc. Correspondence regarding the congress in general should be with the chairman of the organizing committee, Dr. B. M. Duggar, Missouri Botanical Garden, St. Louis.

New Journals.—*Archiv für Wissenschaftliche Botanik*, constituting Abteilung E of *Zeitschrift für Wissenschaftliche Biologie*, has been established for the publication of original research in the entire field of botany. The initial number contains articles on Permeability in *Beggiatoa mirabilis*; a Contribution to the Ultrafiltration Theory of the Plasma, by W. Ruhland and C. Hoffmann; The Influence of Chemical Agencies on the Starch Content and Osmotic Action of the Stomata Guard Cells, by J. Arends; The Distribution of Geotropic Sensitiveness in Negatively Geotropic Plant Organs, by W. Herzog; and Contribution to the Knowledge of the Plasma Membrane, by A. Weis.

Zeitschrift für Vergleichende Physiologie, which constitutes Abteilung C of *Zeitschrift für Wissenschaftliche Biologie*, is being issued at irregular intervals for the publication of original contributions in general and animal physiology. One of the six articles presented in the initial number is entitled Investigations on Temperature Perception in a Few Insects, by Dr. Konrad Herter.

Schweizerische Landwirtschaftliche Monatshefte is being published by the Swiss Agricultural Society and will hereafter contain the papers, proceedings, and discussions formerly published in the *Mitteilungen*, which has been discontinued. The initial number contains among others articles on International Problems in the Field of Agriculture, by Dr. E. Laur; America and the Dairy Congress, by Dr. G. Koestler; and New Problems in the Increasing of Soil Fertility, by Dr. J. Stoklasa.

The Comparative Oologist and Journal of the International Museum of Comparative Oology is being published semiannually by the International Museum located at Santa Barbara, Calif. The initial number contains information regarding the museum and its prospective activities, brief articles on various birds, notes, etc.

Anzeiger für Schädlingskunde zugleich Nachrichtenblatt der Deutschen Gesellschaft für Angewandte Entomologie e. V. is being published monthly under the editorship of Drs. K. Escherisch of Munich and F. Stellwag of Neustadt. The initial number contains several original articles and an account of recent proceedings of the society.

The Pan-Pacific Entomologist is being published as a quarterly by the Pacific Coast Entomological Society in cooperation with the California Academy of Sciences. The initial number contains about 12 original articles, with an editorial and brief notes.

Journal of the Department of Agriculture, Kyushu Imperial University, Fukuoka, Japan, is being issued at irregular intervals as a means of publication of original articles. The articles thus far appearing have been printed in German or English.

The Welsh Journal of Agriculture is being published as an annual by the Welsh Agricultural Education Conference. The initial number contains over 30 original articles dealing with various phases of Welsh agriculture, together with abstracts, reviews, and bibliographical notes.

Mikrochemie, a journal devoted to microchemistry and microphysics, is being published by an international committee at Vienna. The initial number contains four original articles dealing with microchemistry, abstracts, and book reviews.

Annales de Physiologie et de Physicochimie Biologique is to be issued with five numbers per year. The initial number contains seven original articles and a general article entitled Is the Cell Surrounded by a Semipermeable Membrane? by L. Lapicque.

Bulletin Vétérinaire de l'Indochine is a quarterly intended primarily for the publication of original research, but also containing a few abstracts, book reviews, proceedings, official notices, notes, etc.

The Industrial Chemist and Chemical Manufacturer is being issued monthly, chiefly for the publication of original articles on applied chemistry and chemical engineering.

EXPERIMENT STATION RECORD

Vol. 53 December, 1925 No. 8

Again adhering to the policy adopted in 1922 for a meeting in alternate years in Chicago, the Association of Land-Grant Colleges held its thirty-ninth annual convention in that city from November 17 to 19, 1925. In many respects its make-up and its surroundings resembled those of two years before, and its meetings again were substantially simultaneous with those of the National Association of State Universities, the American Society of Agronomy, the Association for the Advancement of Agricultural Teaching, and the American Association of Soil Survey Workers, so that most of the previous participants were again on hand. The biennium which had elapsed, however, had been a period of great importance, culminating in an event which even the casual onlooker speedily discovered had wrought important changes in the program and the point of view of the association and its member institutions.

The Purnell Act and the vision of enlarged opportunities for service which it is bringing permeated the convention atmosphere and dominated its proceedings. The outstanding importance of the measure and the impetus which its enactment has already given to the advancement of agriculture through research were alike revealed in impressive fashion.

The occasion was naturally one for congratulation and encouragement, for, as Secretary Jardine pointed out, the year marked "another forward stride in the development of the influence and usefulness of the land-grant colleges as institutions alike of learning and of teaching," or, as expressed in one of the committee reports, "a new epoch in the history of the stations and of agricultural investigations in this country." But the gathering was only incidentally a "season of rejoicing." There was full realization that the act has brought with it new responsibilities and obligations, and it was to these and to the opportunities which were developing that attention was especially directed.

The attendance at the convention was both large and representative. Every State and the Territory of Hawaii were represented by delegates or visitors, and the total registration was approximately 300. For many institutions delegates were present for agricultural

instruction, research, and extension, engineering, and home economics, although barely half sent their chief executives. For the stations the directors or acting directors were in attendance for all States except Arizona, Florida, and Maryland.

In arrangement the program followed the customary lines of recent years. Notable improvement was evident, however, in the speeding-up of the proceedings by the adoption in the general sessions and in most of the smaller groups of a time limit on nearly all of the papers and discussions. This limit was quite scrupulously adhered to, appeared to impose no serious handicap upon the speakers, and contributed perceptibly to an unusually ample time for discussions from the floor and a final adjournment at an earlier hour than had been found attainable in many years.

The program committee announced as a general topic of discussion the relation of the land-grant institutions to the fundamentals of a forward looking national policy for the development of agriculture, the industries, and home making, and this theme was the keynote of the general sessions. The presidential address was delivered by President A. F. Woods, of Maryland, and was entitled The Land-Grant Institutions in Their Relation to the Development of Agriculture. He was followed by Director H. B. Shaw, of North Carolina, and Dean Anna L. Richardson, of Iowa, who spoke in turn of the corresponding phases of the industries and home making. This trio of speakers revealed how intimately and indispensably the land-grant colleges have become associated with the daily life of the people, and to what an extent they are being relied upon for leadership and the solution of the many problems of the day.

President Woods pointed out that with the passage of the Purnell Act the enlarged program now opening before the land-grant institutions should permit of closer relationships between their services of instruction, research, and extension than ever before. He declared that under the new conditions there must be a fuller public realization that agriculture is a fundamental industry, that it must be prosperous, and that agricultural knowledge must be made available on a world-wide basis. In order to bring about these improvements, he advocated the maintenance of information services along State, National, and international lines, the completion of the soil survey, the mapping and segregation of lands most suitable for reforestation and other specialized uses, the development of dependable markets as favorably located as possible to the sources of production, and the fostering of community and coöperative marketing.

Dean Shaw drew attention to the potentialities of the land-grant colleges in the development of the industries, for which in many cases ingenuity has enabled practice in many lines to outstrip the basic knowledge available. The utilization of electric power, the ex-

tension of highway engineering research, and cooperation with the cotton industry were cited as noteworthy points of attack. Large credit for the advancement of agricultural engineering through research was given to the agricultural experiment stations, and the view was expressed that every land-grant college should seek to develop this important field by the training of men and the fostering of research in other ways.

The changing status of home making from a directly productive enterprise to a manner of life was discussed by Dean Richardson, who saw a large opportunity for effective service in the need for bringing about in the fullest measure a home life which should be physically fit, economically sound, and socially efficient. The larger and more definite provisions for research now becoming possible she regarded as the outstanding development of the times, and one of extreme significance and promise.

The annual address of the Secretary of Agriculture was this year of especial interest in view of Secretary Jardine's long and active identification with the association. It dealt broadly with the relationships of the Department and the colleges and specifically with the Purnell Act and other recent developments.

Secretary Jardine characterized the Purnell Act as one of the most notable instances in history of the granting of public funds for the advancement of knowledge through research. "It is," he said, "a great opportunity, therefore, which has long been looked forward to, and its full realization will call for a high degree of scholarship, organizing ability, and breadth of agricultural outlook."

Special mention was made in the address of the situation as regards agricultural economies, rural sociology, and home economics, *though it was made clear that these newer lines of research should* be correlated with the program for production—the basis of agriculture. In economic research the need was expressed for accurate and definite information acquired under scientific control. "It will not be sufficient to catalogue and describe conditions at a particular time or the immediate consequences that have followed them, but it will be important so to study the data which are searched out and verified as to uncover basic facts and relationships which have permanent value. Likewise in home economies the need for fundamental studies was stressed, and also that for ascertaining not only what may be desirable in the rural home and rural community, but what is practicable and the means by which such improvements might be effected. "This requires," he said, "knowledge and sympathetic understanding of the conditions of rural living, the causes of conditions as they are frequently found, and the combinations and adjustments which need to be taken into consideration."

Secretary Jardine reemphasized his interest in cooperation, stating that "the United States Department of Agriculture wants to do its share in the various fields of research and to do it in closest cooperation and coordination with the State experiment stations," for "we all have our most vital interest not in our organizations and institutions, necessary though these are, but in the betterment of American agriculture." He went on to say that he knew of "no places where this point of view is more completely recognized than in the State experiment stations and land-grant colleges and the Department of Agriculture."

The relations of resident instruction and extension to national progress also received his sympathetic consideration and commendation. In discussing the functions of an extension service, he took the view that its policy should be to furnish to farmers and their organizations the best facts available, but that the decisions to be reached should be determined by the farmers themselves, or, as he put it, "what we can usefully give them is not direction, but facts." Close restriction of the activities of extension staffs to the work of interpretation was also urged, and he deprecated what was characterized as a growing tendency to use extension workers, particularly those regularly located in the counties, in the gathering of research information by means of surveys and questionnaires. This, he declared, is "an activity not contemplated by the Smith-Lever Act, and may materially interfere with regular extension duties if the practice is permitted to develop further."

The address closed with a reminder of the service which the land-grant colleges may render by interpreting agriculture to the people of the towns and cities and carrying to these people an understanding of its significance, its difficulties, and the place which it should occupy in the national economy of the future. This is essential, because so complex and interrelated are the conditions of our civilization today that no one group can stand alone. "In a more specific sense than ever before, our problems are national problems, and they will be solved through our taking into consideration not only all parts of the country and all institutions, but all groups in the population."

The address of the Secretary was followed by short papers from members of three representative organizations, including President O. E. Bradfute of the American Farm Bureau Federation, former Dean Francis C. Shenehon of the Society for the Promotion of Engineering Education, and Dr. Katherine Blunt, president of the American Home Economics Association. These papers all gave much prominence to the influence of research in their respective

fields. The session was brought to a close with a historical account of the Purnell Act, presented by Dean J. L. Hills of Vermont, and the adoption of a resolution in commemoration of the recent death of former President H. J. Waters of Kansas. Subsequently a similar resolution was adopted in memory of former President E. F. Ladd of North Dakota.

The final general session was opened with a summary of the report of the standing committee on instruction in agriculture, home economics, and mechanic arts. This report, presented by its chairman, Dr. A. C. True of the U. S. Department of Agriculture, dealt with methods of conducting examinations in land-grant colleges. It revealed a great diversity in practice now prevailing, and showed the need for further study of these methods with a view to their improvement and standardization.

The report of the bibliographer, also given by Dr. True, departed from its accustomed lines to present a historical summary of the events leading up to the passage of the second Morrill Act in 1890. This is a chapter to which historians have devoted comparatively little attention, and the account revealed the long and persistent effort and the many difficulties and discouragements in the enactment of this important legislation.

For the first time in many years the land-grant colleges for the colored race were represented on the program, President J. M. Gandy of the Virginia Normal and Industrial Institute discussing the progress and status of this group of institutions in a very illuminating and forceful way. President Gandy stated that while in 1914 only 12 of the 5,997 students enrolled were of college grade, the end of the decade showed 2,169 such students, of whom 579 were in agriculture and about 250 in home economics. Meanwhile the physical equipment had been increased in value from $2,507,434 to $7,979,848, with 5,291 acres of land and 192 permanent buildings. The State appropriations had reached $1,425,260 per year, and the total revenues nearly $2,000,000. Much improvement has also been brought about in the qualifications of the instruction staff, 323 of the 586 teachers now being college graduates, but it was suggested that material help could still be rendered by other institutions in the training of teachers for this work. Great need also exists for more adequate housing accommodations for students, modern laboratories, and equipment, improved machinery, the beautification and embellishment of the campus, and in similar directions.

The general sessions closed with a characteristic address by Dr. W. O. Thompson, who recently retired from the presidency of Ohio State University after 38 years of administrative service in various institutions. Dr. Thompson spoke from the subject Looking Backward and Forward, and referred to the constant changes in

ideas and ideals as time goes by, citing the case of the colleges of agriculture as formerly most interested in growing the traditional two blades of grass, but now less concerned with this phase than that of the economic disposition of the hay. Such transitions, he argued, demanded an open mind and a progressive spirit, and their inculcation and development he conceived to be the abiding mission of the land-grant institutions.

The presidency of the association was bestowed upon Dean E. A. Burnett of Nebraska and the vice presidency upon President J. L. Coulter of North Dakota. A vacancy on the executive committee, occasioned by the withdrawal from the association of President W. B. Bizzell of Texas, was filled by the return to the committee of President Woods. Dean J. L. Hills was again continued as secretary-treasurer with the appointment of Director S. B. Haskell of Massachusetts as assistant secretary. The policy of filling committee vacancies by the selection of new members rather than by reappointments was very largely followed. A complete list of these appointments is given on page 799 of this issue.

The various section and division programs which had most direct interest from the point of view of research were those of the joint session of the three agricultural divisions which was specifically devoted to research matters, the half-day program on research in home economics of that section, and the meeting of the experiment station division. One of the most important general contributions was made by Dean F. B. Mumford of Missouri in a discussion of the function of research in developing a national agricultural policy. Dean Mumford pointed out that a great impediment to the formulation of such a policy and the securing of the necessary governmental action to render it effective is the lack of the necessary facts, and that it is the duty of the stations to supply many of these facts. The need is now especially great along economic lines, and Dean Mumford accordingly recommended considerable concentration upon this type of problems. In view of the important questions raised by Dean Mumford's paper, the section voted to request the executive committee to prepare a statement based thereon for publication and distribution.

Some of the results already secured in land economics which point the way to a national land policy were set forth by Dr. L. C. Gray of the Bureau of Agricultural Economics. Dr. Gray pointed out that the last decade has seen little of a self-propelling movement toward the land, the initiative now coming mainly from railway companies, land interests, and other private agencies. He believed that on economic grounds our agriculture should be protected from unwarranted competition for new areas, and that if it can be put

on sound economic footing, it will be able to take care of new developments in the form of private enterprises. Greater attention to the systematic classification of lands he regarded as very desirable, and he felt that the association could help in this regard by working out a policy of orderly land utilization and settlement.

Director B. Youngblood of Texas recounted some of the contributions to agricultural progress, citing as illustrations plant introduction and improvement, the control of diseases and insect pests, the use of fertilizers, the fundamental work in animal nutrition, and the studies of grazing problems. Much of this work has not only, as he pointed out, enhanced the farmer's economic efficiency, but has also improved his living and social conditions.

The question of research in home economics naturally received much attention because of its timeliness, and the session devoted to its problems attracted a goodly number of station directors and others immediately interested in the organization and development of this work. Two main topics were presented, that of organization, dealt with particularly by Dr. R. E. Buchanan, dean of graduate work in the Iowa State College, Director R. W. Thatcher of New York, and Dean Margaret Justin of Kansas, and that of standards for research, presented by Dr. E. W. Allen of the Office of Experiment Stations. Some differences of opinion were noted as to the best form of organization. Apparently not a little sentiment still remains for the plan of separate home economics experiment stations, and Dr. Buchanan suggested for land-grant colleges the organization of a home economics research or home economics experiment station council made up of all departments in the institution "that can and should contribute materially to home economics research." On the whole, however, there was virtual unanimity in accepting the status of home economics research in the agricultural experiment stations resulting from the passage of the Purnell Act as a long step forward and one for which there should be forthcoming the heartiest cooperation.

On the subject of standards for home economics research, Dr. Allen advanced the thesis that "the standards for work in home economics under the Purnell Act should not be essentially different from the accepted ones for investigation in other fields. Because the subject has been less cultivated the work may need to be more elementary in some respects at the outset, but its aim should nevertheless be to make the investigation purposeful, thorough, and progressive from one point to another. There is a demand for practical facts, and to be practical is the ultimate aim; but short cuts give fragmentary and incomplete information from which it often is dangerous to generalize. The object is to advance the science as well as the art, to improve the art on the basis of science."

Dr. Allen pointed out that some difficulties are being encountered in the determination of a starting point for investigations and deciding upon a subject. This uncertainty has often led to surveys of various kinds for the frankly expressed purpose of seeing what needs to be done. Conceding that the survey method has its place, he showed the danger of relying upon it too implicitly and extensively, of mistaking it for an end rather than a means. He pointed out that many thousands of surveys on home conditions have been carried on, so that there is already a large background of information regarding general conditions in different parts of the country, and it is a question how far the ordinary type of survey is now needed and how far it serves the ends of substantial constructive inquiry. He also stressed the importance of a clear and definite procedure and of the need of imagination and vision.

Another paper by Dr. Allen, before the experiment station division, summarized the status of work under the Purnell Act. This paper showed that to November 15, 1925, 397 projects had been definitely stated and agreed upon, representing nearly complete returns from three-fourths of the stations and partial returns from nine others. Of these projects 181 have been in fields of production, 145 in agricultural economics, 53 in home economics, and 18 in rural sociology. Thus far 39 States have submitted projects in agricultural economics, 36 in production, 27 in home economics, and 11 in rural sociology.

Regarding the character of the work projected, Dr. Allen stated that despite some exceptions which point to the desirability of critical examination of projects at the stations before submission for approval, "in the older and more established lines of investigation relating to production, the work proposed is for the most part of high grade, lying midway between the more elementary type of tests and experiments, and the advanced type of original research. Although frequently directed at rather immediate results, for the most part it has a clearly defined objective, and is planned as thoroughgoing investigation. It is progressive, in that it takes account of the status of investigation and of the methods of procedure which have been developed. There is a general absence of the type of duplication that has caused comment in the past, and, to a large and gratifying degree, it supplements in a thoroughly scientific manner the work the stations have been doing."

The newer fields upon which the stations are now embarking, he went on to say, present a new set of questions as to ways and means, and involve somewhat different ideas of research from those in the biological and physical sciences. Perhaps as a result of these conditions a good deal of variation has been encountered. "Some of

the proposals have been quite simple and routine, like recording land values as shown by sale prices, the calculation of price indexes to be issued from time to time, and other services; while in other cases the aim has been so far-reaching as to suggest that the whole farming problem may be cleared up by a single investigation." On the other hand, there were also found "a large number of carefully conceived well-organized investigations which conform to the highest standards of research and give much promise." These were regarded as examples of sound research in these lines, "an earnest of what may be expected when the subjects become better organized."

Further consideration to some of the points raised in the foregoing paper was given in a stimulating and constructive paper by Dr. J. D. Black of Minnesota, entitled The Principles Which Should Characterize Sound Investigation in the Field of Agricultural Economics and Rural Sociology. This is a theme in which there is deservedly much interest, and one which in view of its importance and timeliness, it is hoped to discuss at some length in these columns in the near future.

Under the title of Organization for and Relationships in Cooperative Research, Director T. P. Cooper of Kentucky discussed the relationships of the Department of Agriculture and the stations, especially in agricultural economics. The varying conditions were shown to be an important factor in the basis of cooperation, certain projects being best handled by single States, others by State leadership with national cooperation, and still others by national leadership with State cooperation. The providing of suitable machinery for the arrangement of cooperation where feasible was indicated as quite desirable.

The report of the joint committee on projects and correlation of research, presented by Director Mumford of Missouri, reviewed the events of the year and notably the developments since the St. Louis meeting.

The continuation of the special committees on the six national projects for cooperation authorized at St. Louis was recommended. These committees would be appointed annually by the executive committee of the association, and it would be their function to study projects already submitted as to their scope and adequacy, to act as agencies for contacts with the cooperators, to canvass the field as to additional problems, to act as advisory committees in their representative lines, and to report to a general committee on the status of the work as a whole. This recommendation was adopted by the division with an expression of its appreciation of the results obtained, and was later confirmed for the association.

The joint committee on the publication of research reported through its chairman, Director J. G. Lipman of New Jersey, that during the past year 185 contributions from the Department of Agriculture, 83 from the stations, and 9 from cooperating institutions had found publication in the *Journal of Agricultural Research*. The committee recommended an exhaustive survey of the channels through which the stations are now publishing material. Its report was adopted by the division.

The report of the committee on experiment station organization and policy, Director Thatcher chairman, dealt with policies under the Purnell Act, suggesting ten general principles as the basis of policy in its administration. They dealt with such matters as the purpose of the act, the type of investigation, the character of projects, concentration of effort, the need of trained workers, the problem as the unit of effort, cooperation, and the function of administration. The supplementary character of the act, the need of a systematic well-rounded research program, the desirability of cooperation and coordination within the stations, between stations, and with other agencies, and the ever-increasing importance of wise and sympathetic administration and support were set forth in a clear and definite way. These principles were adopted by the division, and their immediate dissemination among the stations was arranged for.

Taken as a whole, the Chicago convention of 1925 seems certain to be longest remembered and most readily identified as the meeting of the association following the passage of the Purnell Act, for it was this legislation which gave character and individuality to its proceedings. Despite the recent date of its enactment it is already evident that this law is destined to become a potential factor in the development of every land-grant college, and ultimately in the advancement of the agriculture of every State. The convention revealed itself as responsive to the new conditions, conscious of its responsibilities, and alert to utilize to the utmost the opportunities now being presented. The meetings contributed materially to the clarification of ideas and ideals of research, particularly in the newer fields of inquiry, and did much to strengthen the conceptions of research as the foundation of an agricultural program. This augurs well for the overcoming of the difficulties which will be encountered in the further development of a leadership which should assist greatly in the enrichment of the farm life of the Nation and thereby promote the general welfare.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Annual reports on the progress of chemistry for 1923, edited by A. J. GREENAWAY and C. SMITH (*Ann. Rpts. Prog. Chem.* [*Chem. Soc., London*], *20* (*1923*), *pp. IX+314, pl. 1, figs. 6*).—This continues for 1923 the series previously noted (E. S. R., 49, p. 608).

Annual reports on the progress of chemistry for 1924, edited by C. SMITH (*Ann. Rpts. Prog. Chem.* [*Chem. Soc., London*], *21* (*1924*), *pp. IX+310, figs. 4*).—In the 1923 report in the series noted above a significant change has been made in classification by merging the section on physiological chemistry with that on agricultural chemistry and vegetable physiology under the general heading of biochemistry. The new section, by J. C. Drummond and H. J. Page, contains subsections on soils, the chemistry of the living plant, and biochemistry of animals.

Two other sections have been added on subatomic phenomena and radioactivity by F. W. Aston and colloid chemistry by W. Clayton.

Laboratory manual of biological chemistry, with supplement, O. FOLIN (*New York and London: D. Appleton & Co., 1923, 3. ed., pp. IX+301, figs. 7*).—This is the third edition of the laboratory manual of biological chemistry which is used at the Harvard Medical School.

Studies in the physical chemistry of the proteins.—V, The molecular weights of the proteins. Part 1, The minimal molecular weights of certain proteins, E. J. COHN, J. L. HENDRY, and A. M. PRENTISS (*Jour. Biol. Chem.*, *63* (*1925*), *No. 3, pp. 721–766*).—In this extensive investigation use has been made of solubility and electromotive force measurements to determine the equivalent combining weights for acid and for base of different proteins, and the results thus obtained have been compared with the minemal molecular weights of the proteins calculated from their elementary constituents and from their content of amino acids. As thus determined, the minimal molecular weights of 14 proteins have been estimated as follows: Gelatin 10,300, zein 19,400, gliadin 20,700, hemocyanin of Limulus 22,700, Bence-Jones' protein 24,500, edestin 29,000, hemocyanin of Octopus 33,500, egg albumin 33,800, glutenin 26,300, fibrin 42,000, serum albumin 45,000, hemoglobin 50,000, serum globulin 81,000, and casein 192,000.

A bibliography of 73 titles is appended.

A protein in the edible portion of orange.—Preliminary paper, A. H. SMITH (*Jour. Biol. Chem.*, *63* (*1925*), *No. 1, pp. 71–73*).—An examination by the method of Osborne, Wakeman, and Leavenworth (E. S. R., 46, p. 801) is reported of the nitrogenous constituents of the edible portion of the orange.

After centrifuging the crude juice as burred from the fruit, three layers were obtained—an upper layer of fibrous shreds, a middle clear light straw-colored fluid layer, and a bottom orange-colored layer of gelatinous consistency. The middle layer, after filtering, was found to contain about 12 per cent of total solids and 0.1 per cent of total nitrogen, one-third of which proved

to be amino nitrogen. There was only a small increase in amino nitrogen after acid hydrolysis, indicating that the clear juice contains practically no protein.

From the lower layer was obtained by treatment with weak alkali and N/2 acetic acid, a yellow precipitate separating at pH 4.7. This was found to consist of the pigment, together with a protein insoluble in water, neutral salt solution, and weak acids, soluble in weak alkali, not precipitable by 95 per cent alcohol, and not coagulable by heat in neutral, acid, or alkaline reaction. The protein was also accompanied by a polysaccharide resembling pectin, which could be partially but not completely separated by the repeated solution and reprecipitation of the protein.

It is pointed out that the protein found in the orange pulp is distinguished from the conventional classes of proteins by its unusual solubilities. The protein is under ordinary conditions insoluble in the fruit, since its precipitation point is pH 4.7 and the H-ion concentration of orange juice is 4.3.

Physiological and biochemical studies on cereals.—IV, On the presence of amino acids and polypeptides in the ungerminated rye kernel, S. L. Jodidi and J. G. Wangler (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 989–994*).—Continuing the series of studies previously noted (E. S. R., 53, p. 502), the proportions of amino acid and polypeptide nitrogen found in the ungerminated kernels of three varieties of rye are summarized as follows:

Distribution of the nonprotein nitrogen in the ungerminated rye kernel

Variety of rye	Amino nitrogen		Peptide nitrogen		Acid amide nitrogen	
	Oven-dry kernel	Total nitrogen	Oven-dry kernel	Total nitrogen	Oven-dry kernel	Total nitrogen
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
North Dakota No. 959	0.075	3.09	0.162	6.69	0.090	3.72
Von Rümker	.101	5.39	.155	8.30	.093	4.96
Reg. Rosen	.099	5.97	.070	4.21	.069	4.14

Some nitrogenous constituents of the juice of the alfalfa plant.—III, Adenine in alfalfa, H. B. Vickery and C. S. Leavenworth (*Jour. Biol. Chem., 63 (1925), No. 3, pp. 579–583*).—Further studies on the proteins of the alfalfa plant have shown that the base yielding a picrate melting at 298° C. (E. S. R., 52, p. 610) is adenine, which is present in amounts corresponding to 0.012 per cent of the fresh plant and 0.066 per cent of the dry plant. Since adenine nitrogen accounts for 2.72 per cent of the nitrogen of the alfalfa filtrate, it is thought to be an important constituent of the juice present in the physiologically active part of the plant.

The lower melting points for adenine picrate previously given in the literature are attributed to the presence of small amounts of impurities and to too slow a rate of heating. When the picrate is heated at a rate of approximately 1° in 3 seconds there is sharp decomposition, with evolution of gas at 298°.

The spontaneous decomposition of butter fat, C. A. Browne (*Indus. and Engin. Chem., 17 (1925), No. 1, pp. 44–47, fig. 1*).—The data upon which this discussion of the causes and mechanism of the spontaneous decomposition of butter and other fats is based were obtained in periodic analyses of butterfats which had been exposed to the air in light and darkness at room temperature since 1897. Analyses of these fats after storage for a short time (E. S. R., 11, p. 616) and for 15 years[1] showed that the butterfats had lost weight

[1] Science, 42 (1915), No. 1096, p. 946.

owing to the escape of water, carbon dioxide, volatile acids, and aldehyde decomposition products.

In an attempt to measure the loss in weight, samples of butterfat kept in the light and dark were weighed at frequent intervals over a period of 9 years (from 1915 to 1923, inclusive) and the percentage changes in weight plotted against the time. The resulting curves showed a marked increase in weight in both samples during the first year, a slower increase followed by a decrease in the second year, and then periodic increases and decreases. This rise and fall in weight, which was greater in the samples kept in the light than in the dark, followed the humidity curve of the atmosphere. The maximum gain in weight for the fat in the light after 4 years and 5 months was 3.58 per cent and the average loss in weight per year thereafter 0.2 per cent. This figure corresponds closely with the annual loss, 0.17 per cent, observed in one of the samples of fat which had been stored for 27 years.

Determinations of the various constants of the fats after this prolonged storage showed that losses in the iodine value were accompanied by increases in the amount of free and volatile acids. The free insoluble acids of the decomposed butterfat contained oleic acid in almost the same proportions as in the neutral fat. The insoluble acids showed pronounced ester and acetyl numbers, indicating the presence of fatty anhydrides or lactones and hydroxy acids.

The first step in the decomposition of the fat is thought to be the action of a molecule of atmospheric oxygen at an unsaturated bond of the fatty acid molecule, 1 atom being absorbed and the other set free. The free oxygen attacks the surrounding glyceride molecules, breaking them up gradually into free soluble and insoluble fatty acids, aldehydes, carbon dioxide, water, and other decomposition products. A secondary cause of decomposition is thought to be the effect of absorbed moisture, which exerts a hydrolytic action, rising or falling according to the humidity and temperature of the air.

Chemical changes occurring in calcium cyanamide-acid phosphate mixtures, K. D. Jacob and J. M. Braham (*Indus. and Engin. Chem., 17 (1925), No. 1, pp. 64–68, figs. 2*).—"This paper presents the results of a study of the chemical changes occurring in simple mixtures of calcium cyanamide and acid phosphate as affected by the proportion of the constituents in the mixtures, by the moisture and free acid content of the phosphate, and by the temperature and duration of storage. The changes in calcium cyanamide in mixture with mono- and dicalcium phosphate and in dicyanodiamide and urea in mixture with acid phosphate were also studied.

"Urea, dicyanodiamide, guanylurea, and ammonia were found to be the main nitrogen transformation products on storage of simple mixtures of calcium cyanamide and acid phosphate, and usually accounted for 80 to 85 per cent of the nitrogen added.

"In mixtures containing 1 part of calcium cyanamide per 20 parts of freshly manufactured acid phosphate, about 75 per cent of the nitrogen was transformed into urea and from 0 to 13 per cent into guanylurea and dicyanodiamide. The decrease in available phosphate in such mixtures was almost negligible, even after 11 months' storage. In mixtures containing double this amount of cyanamide, urea constituted only about 40 per cent of the transformation products, dicyanodiamide and guanylurea representing most of the remainder. A considerable decrease in available phosphate also occurred in such mixtures. With air-dried acid phosphate (low moisture and free-acid content) only about 15 per cent of the nitrogen was obtained as urea and approximately 70 per cent as dicyanodiamide and guanylurea, even in mixtures containing only 1 part of calcium cyanamide to 20 parts of acid phosphate.

"Dicyanodiamide is hydrolyzed to guanylurea, not only by the free acid in acid phosphate, but also by monocalcium phosphate. Urea is stable in mixture with acid phosphate at ordinary storage temperatures, but at 70° C. or higher it is rapidly hydrolyzed to ammonia."

Use of iron or nickel crucibles for alkali determinations, A. W. Epperson and R. B. Rudy (*Indus. and Engin. Chem., 17 (1925), No. 1, p. 35*).—Results obtained by two workers on alkali determinations by the J. Lawrence Smith method, using platinum, iron, and nickel crucibles, are reported in tabular form. The results indicate that either nickel or iron crucibles can be used with entire satisfaction for fusions in these determinations, that the accuracy of the results is comparable to that obtained by the use of platinum, and that the initial cost, danger of loss by theft, care required, etc., are far less.

Standardizing acids and bases with borax, M. G. Mellon and V. N. Morris (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 145, 146, figs. 2*).—Attention is called to the availability of borax for the direct standardization of both acids and bases. With acids the salt can be used alone, with methyl orange as indicator. With bases sufficient mannitol is added to combine with the borax to form a complex acid. In this titration phenolphthalein or an indicator covering the same range should be used. Titration curves are reported for hydrochloric, sulfuric, phosphoric, and acetic acids with a solution of borax; for sodium, potassium, and barium hydroxides with a solution of borax containing mannitol; and for solutions of borax containing different amounts of glycerol or mannitol with sodium hydroxide.

The spectrophotometric determination of hydrogen-ion concentrations and of the apparent dissociation constants of indicators.—II, Thymol blue. III, Bromocresol green, W. C. Holmes and E. F. Snyder (*Jour. Amer. Chem. Soc., 47 (1925), No. 1, pp. 221–229, figs. 3*).—The methods suggested in the first paper of the series (E. S. R., 51, p. 611) have been applied to the determination of the dissociation constants of the indicators thymol blue and bromocresol green.

The apparent dissociation constants of thymol blue in its alkaline and acid ranges have been found to be 8.91 and 1.5, respectively. The dissociation of the indicator was found to be normal over its useful alkaline range, but appreciably retarded beyond the mid-point in its acid range. The apparent dissociation constant of a relatively pure sample of bromocresol green was 4.68 and of two commercial products 4.65 and 4.69. The dissociation of this indicator also conformed to the theoretical formula over the useful portion of its alkaline range.

The effect of hydrogen-ion concentration on the estimation of diastatic power by the polarimetric method, H. C. Gore (*Jour. Amer. Chem. Soc., 47 (1925), No. 1, pp. 281–283, fig. 1*).—Data are reported showing that the diastase in an infusion of malt is as sensitive to changes in H-ion concentration as the highly purified diastase of Sherman, Thomas, and Baldwin (E. S. R., 40, p. 504). It is also shown that by the use of a suitable buffer fluctuations in H-ion concentration are easily controlled. A satisfactory buffer consists of 10 cc. of N acetic acid and 10 cc. of N sodium acetate in each liter of soluble starch solution.

Quantitative organic microanalysis, F. Pregl, trans. by E. Fyleman (*London: J. & A. Churchill, 1924, pp. XV+190, figs. 42*).—This is an English translation of the second edition of the author's system of microanalysis originally appearing in Abderhalden's Handbuch der Biochemischen Arbeitsmethoden (E. S. R., 27, p. 107).

Perfection of chromic acid method for determining organic carbon, J. W. White and F. J. Holben (*Indus. and Engin. Chem., 17 (1925), No. 1, pp.*

83–85, *fig. 1*).—In the authors' modification of the chromic acid method of determining organic carbon, the sulfuric-chromic acid mixture is boiled for 30 minutes as suggested by Ames and Gaither (E. S. R., 32, p. 805), but arrangement is made for the collection of SO_3 fumes in a U tube containing sulfuric acid of constant boiling point (98.33 per cent) in contact with coarse glass wool. This has been found to eliminate the necessity for secondary combustion and to reduce greatly the time required for the determination. The preparation of the materials and the technique of the method are described, the apparatus is described and illustrated, and data are given on the use of the method with a large number of materials.

Modification of Scales' method for determination of nitrates, P. L. Hibbard (*Indus. and Engin. Chem., 17 (1925), No. 1, p. 58*).—A study of the cause of the low and irregular results sometimes obtained with the Scales method for determining nitrates (E. S. R., 36, p. 504) has led to the conclusion that the errors are due to too great alkalinity of the copper-zinc couple, and may be prevented by using comparatively pure magnesium oxide or by neutralizing the impure magnesium oxide with an acid. The technique of a modification of the method according to the second suggestion is outlined. It is noted in conclusion that the Devarda method has been found to be more reliable than the Scales method, particularly on account of the fact that no difficulties are caused by the presence of soluble phosphates in the solution.

Determination of mineral nitrogen in fertilizers, J. E. Breckenridge (*Indus. and Engin. Chem., 17 (1925), No. 1, p. 95*).—Of the two Official methods of determining nitric and ammonia nitrogen in fertilizers, the zinc-iron method has been found to give high results on samples containing soluble organic nitrogen such as is present in mixed fertilizers.

Determination of moisture in wheat and flour, Part II, H. Snyder and B. Sullivan (*Indus. and Engin. Chem., 16 (1924), No. 11, pp. 1163–1167, figs. 5*).—The study previously reported (E. S. R., 52, p. 205) has been extended to moisture determinations on the same flours, with the same technique as to size of samples and drying dishes, by desiccation over concentrated sulfuric acid with and without vacuum and over phosphoric anhydride.

These methods proved to be no more accurate than the ones previously studied. The maximum results with sulfuric acid was somewhat lower than those obtained by vacuum drying. The variations in results obtained by the use of different methods with the same sample are shown by the following percentages of moisture obtained on the same sample by various methods: Water oven 11.36 per cent, air oven 13.33, vacuum oven 14.37, and desiccation over sulfuric acid 13.90.

The analysis of milk, G. Rodillon (*L'Analyse des Laits. Paris: Biblioth. Prat. Pharm., 1924, pp. [6]+206*).—This monograph deals exclusively with methods used in the analysis of milk, with emphasis on the interpretation of results. The first part is devoted to methods for the determination of various constituents of milk. This is followed by a discussion of the French official methods, including the detection of antiseptics and other adulterants. The laws of 1905 and 1919 concerning the repression of adulteration, definitions of terms used in the analytical procedures, lists of reagents and necessary apparatus, and a brief bibliography are included.

Chlorimetric determination of tryptophane by the vanillin-HCl reaction and the quantitative separation from indole and skatole, I. Kraus (*Jour. Biol. Chem., 63 (1925), No. 1, pp. 157–178*).—A critical study is reported of the vanillin-HCl reaction for trytophane alone and in the presence of other nitrogen compounds. With pure tryptophane the optimum conditions were obtained by introducing into a 50-cc. volumetric flask between 0.2 and 1 mg. of trypto-

phane in 2 cc. of water, adding 0.4 cc. of 0.5 per cent vanillin in 50 per cent acetic acid, mixing, adding 15 cc. of concentrated HCl, and after 24 hours diluting to 50 cc., mixing, and comparing the color in a colorimeter. This method gave good results with and without mercury precipitation.

If indole and skatole are present in the mixture containing tryptophane, these may be removed by several extractions with toluene. It was found impossible to recover tryptophane quantitatively from proteins when hydrolyzed by acids, by barium hydroxide, or by U. S. P. pancreatin. Different decomposition products appeared in the barium hydroxide hydrolysis of proteins from those in the barium hydroxide treatment of tryptophane.

The sensitivity of the vanillin-hydrochloric acid reaction as compared with the phenol reaction on pure tryptophane with or without added mercury is said to be 2:1. By this method it is said to be possible to detect tryptophane in zein and gelatin, which have usually been considered to be tryptophane-free.

Inversion losses in cane sugar manufacture, C. F. Walton, jr., M. A. McCalip, and W. F. Hornberger (*Indus. and Engin. Chem., 17 (1925), No. 1, pp. 51–56*).—"Loss of sucrose due to inversion has been carefully investigated in a number of industrial procedures for cane sugar manufacture. Analytical methods of a suitable degree of precision have been selected, and the typical operations of heating and defecating the juice, concentrating the juice in multiple-effect evaporators and vacuum pan, and finally crystallizing have been reproduced on a small scale, in so far as the controlling factors of time, temperature, pH, and sucrose concentrations are concerned. The variation in pH of juice during the sequence of treatment from defecation to crystallization has been studied.

"The data indicate that in defecating cane juice for raw sugar manufacture the initial pH at which it is safe to carry the juice lies between 7.0 and 8.0—i. e., at such a point that the resulting sirup has a pH value between 6.7 and 7.0. In the sulfitation process by which direct consumption sugar is produced, a lower pH and correspondingly higher titrated acidity may be safely carried. The sulfites present in these sugarhouse liquors apparently retard the progressive increase in acidity by the decomposition of dextrose and fructose, and may also possess a specific inhibiting property as regards inversion of sucrose."

The story of canned foods, J. H. Collins (*New York: E. P. Dutton & Co., 1924, pp. X+251, pls. 31*).—This is a nontechnical description of commercial canning processes, with a final chapter on home canning. Among the many illustrations are interesting photographs taken at the Appert cannery, Paris, where the cold pack method originated. These include a photograph of the first autoclave or steam cooking apparatus, the invention of R. Chevallier-Appert in 1852.

A study of the influence of inoculation upon the fermentation of sauerkraut, O. R. Brunkow, W. H. Peterson, and E. B. Fred (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 955–960*).—Previously reported data[^1] indicating that sauerkraut may be improved in quality by the use of selected cultures of lactic acid bacteria have been confirmed by experiments conducted on a scale more nearly approaching factory conditions of sauerkraut manufacture. Two cypress vats were filled with 250 lbs. each of cut cabbage, with the addition of 2.5 per cent of common salt and, in one vat, 2 liters of a 3-day culture of lactic acid bacteria in a 1 per cent glucose-yeast-water medium diluted with an equal volume of water. The second or control vat received an equal amount of water but no inoculation. The vats were stored at room temperature of 20° C. (68° F.), and samples of the kraut were removed from time to time for

[^1]: Centbl. Bakt. [etc.], 2. Abt., 58 (1923), No. 9–12, pp. 199–204.

chemical and bacteriological studies, the former consisting of determinations of the amount of volatile and nonvolatile acid and alcohol and the total amount of sugar in the brine and the latter of the total number of bacteria present and their fermentation reactions.

Bacteriological observations by the plate method showed at first a mixed flora including many different forms of bacteria and a large number of molds, but by the fifth day only two types of colonies remained, a small lens-shaped colony growing beneath the surface and a larger surface colony. The ratio of small to large colonies was higher in the inoculated than in the uninoculated kraut.

The principal difference noted in the Breed plate method was the early predominance of rod forms in the uninoculated kraut. In the inoculated, rod and coccus forms were present at first in about equal numbers. In both, during the course of fermentation, the number of coccus forms tended to decrease, the change being more rapid in the uninoculated than in the inoculated kraut.

The fermentation studies showed an increase in the number of bacteria capable of causing fermentation during the first seven days, followed by a decrease. At the height of fermentation the number of mannitol fermenters was less than the number of sugar fermenters, but toward the end of the fermentation the difference was not noticeable. Large numbers of xylose fermenters were present, particularly in the uninoculated kraut. The data obtained with litmus milk showed a much more rapid increase in lactic acid organisms in the inoculated than in the uninoculated kraut.

The chemical data confirmed the bacteriological in that the inoculated kraut was higher in lactic acid and lower in alcohol and acetic acid than the uninoculated. The destruction of sugar was slower, although the total acidity was about the same.

As judged by flavor and color at the end of 73 days, the inoculated kraut was superior to the uninoculated. "The results are suggestive but not final. Many experiments on a factory scale must be conducted to determine not only the possibility but also the practicability of such a procedure."

The coloring matter of lime juice, F. Hardy and F. H. S. Warneford (*Indus. and Engin. Chem., 17 (1925), No. 1, pp. 48–50*).—The authors have isolated and examined the coloring matter present in the outer yellow rind of limes. In the commercial manufacture of lime juice this coloring matter is frequently carried into the juice and when present causes the juice to darken in color. In the manufacture of citric acid from limes considerable difficulty is generally experienced in the removal of the coloring matter.

The coloring matter was separated from the rind by extraction with 95 per cent alcohol in a Soxhlet apparatus through which sulfur dioxide was passed to prevent oxidation, precipitation of various impurities from the concentrated extract by lead nitrate, precipitation of the coloring matter by lead acetate, and decomposition of the lead compound with sulfuric acid and barium hydroxide. The anhydrous substance obtained by drying the filtrate in a desiccator over sulfuric acid is described as "a greenish yellow-brown vitreous solid with astringent acid taste, extremely hygroscopic, readily soluble in water, alcohol, acetone, pyridine, and acetic acid, slightly soluble in ethyl acetate, but insoluble in ether, benzene, petroleum, carbon disulfide, and chloroform." The application of various tests showed it to be a phlobatannin (catechol tannin), closely resembling but not identical with caffetannic acid.

As a result of these observations, it is suggested that fresh lime juice should be bottled and stored with complete exclusion of air to prevent darkening, as well as loss of antiscorbutic activity. In the manufacture of citric acid from lime juice excessive liming should be avoided.

An examination of the dissolved tar from the carbonization of hard maple, L. F. HAWLEY and H. N. CALDERWOOD, JR. (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 149–151*).—Preliminary work is reported on the physical and chemical examination of the dissolved tar obtained from crude pyroligneous acid resulting from the distillation of hard maple in a laboratory retort. The tar was obtained from the pyroligneous acid by distilling at atmospheric pressure at 140° C. until no more condensate was obtained and finishing the distillation at 740 mm. pressure. The distillate at 740 mm. was used in most of the work reported.

The dissolved tar was found to be more readily soluble in pyroligneous acid than settled tar, showing the two to differ in composition. Benzene and chloroform dissolved a considerable portion of the tar, but not enough to justify their use in a commercial process of refining. An important difference noted between the dissolved and settled tar was the great instability of the former on distillation at atmospheric pressure.

Chemical products of cellulose (*Indus. and Engin. Chem., 17 (1925), No. 1, p. 33*).—A condensed chart of the principal chemical products derived from cotton and from wool.

METEOROLOGY

Weather forecasting as an aid in preventing and controlling forest fires, E. B. CALVERT (*U. S. Mo. Weather Rev., 53 (1925), No. 5, pp. 187–190*).—A brief account is given of what the Weather Bureau has done in recent years by means of weather forecasts to aid in controlling forest fires, indicating the present status, methods, and efficiency of such work in different sections of the country. "The issuing of forecasts as an aid to the protection of forests against fires is not new. At first the regular daily forecasts were applied in the main incidentally by forestry interests in the Pacific Coast States, but the advantages derived from utilizing them were so apparent that requests for a service more directly applicable to the particular purpose became very insistent, especially in the far Western States, and led to the organization of a distinctive forecast project, known as the fire-weather warning service." Similar but less highly specialized service has been organized in other parts of the country under the handicap, however, of lack of funds for the thorough scientific investigations required.

Monthly Weather Review, [May–June, 1925] (*U. S. Mo. Weather Rev., 53 (1925), Nos. 5, pp. 187–242, pls. 11, figs. 15; 6, pp. 243–283, pls. 11, figs. 17*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for May and June, 1925, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 5.—Weather Forecasting as an Aid in Preventing and Controlling Forest Fires, by E. B. Calvert (see above); The Warm February of 1925 in the United States (illus.), by A. J. Henry; Tornadoes of the United States, 1916–1923 (illus.), by H. C. Hunter; The 11-year Period of Temperature in the Northern Hemisphere in Relation to the 11-year Sun-spot Cycle (illus.), by F. Baur; Radiation and Polarization Measurements during the Solar Eclipse of April 8, 1921, at Davos, by C. Dorno; and Seasonal Precipitation in California and Its Variability, Part II (illus.), B. M. Varney (see p. 719).

No. 6.—Investigation of the Dust Content of the Atmosphere (illus.), by H. H. Kimball and I. F. Hand; High Maximum Temperatures in Late Spring of 1925 (illus.), by A. J. Henry; Monthly Forecasts by Correlation: June, a Key Month (illus.), by C. D. Reed; A New Method of Charting Storm Fre-

quency (illus.), by K. Kelsey; Correlation in Seasonal Variations of Weather—A Further Study of World Weather, by G. T. Walker; Upper-air Observations at Apia Observatory (illus.), by A. Thomson; Hourly Rainfall Probabilities at Lansing, Mich. (illus.), by C. L. Ray; The Present Meteorological Needs of Aeronautics, by F. W. Reichelderfer (abs.); and The Rainfall Capacity of the "Equatorial Current," a Periodic Factor in Climate (illus.), by L. Besson, trans. by B. M. Varney.

Climatological data for the United States by sections, [May–June, 1925] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 12 (1925), Nos. 5, pp. [188], pls. 4, fig. 1; 6, pp. [191], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1925.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and E. H. Wheeler (*Massachusetts Sta. Met. Buls. 439–440 (1925), pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1925. The data are briefly discussed in general notes on the weather of each month.

Seasonal precipitation in California and its variability, [I, II], B. M. Varney (*U. S. Mo. Weather Rev., 53 (1925), Nos. 4, pp. 148–163, pl. 1, figs. 3; 5, pp. 208–218, pl. 1, figs. 7*).—As a result of the studies here reported in some detail, it is stated that "(1) the eastern part of the Interior Valley and the Sierra in general show less variability than the western part of the valley and the Coast Ranges, (2) there appears to be no consistent increase or decrease of variability with increase of altitude in the Sierra, (3) the departures in the eastern part of the Interior Valley tend to increase toward the mountain or desert country north and south of them, respectively, (4) the departures of the southeastern desert region are the most extreme in the State, (5) along a narrow coastal zone, departures appear to be distinctly less in the northern half of the coast than in the southern, (6) the departures in the Coast Ranges average somewhat higher than those of the eastern Interior Valley and of the northern coastal zone, and do not change significantly from north to south along the ranges, (7) while there does not appear to be any strong relation between the amounts of mean percentage departure and the amount of the average seasonal rainfall nor any clear evidence of a gradual increase in variability with decreasing latitude, nevertheless, speaking very broadly, the agricultural region of southern California west of the desert does show a somewhat greater variability than the major agricultural regions north of latitude 35°." The State is divided into seven regions, in which the average seasonal variation in rainfall ranges from under 30 to over 40 per cent of the normal.

SOILS—FERTILIZERS

Climatic agencies in their relation to soil colloids, R. M. Salter (*Jour. Amer. Soc. Agron., 17 (1925), No. 5, pp. 294–307*).—A review of data on the subject is presented, together with an extensive list of references.

Alkali soils—origin, examination, and management, P. L. Hibbard (*California Sta. Circ. 292 (1925), pp. 14*).—Information is briefly presented on the origin, nature, effects, examination, treatment, and cropping of alkali soils.

The soil mulch in the absorption and retention of moisture, M. A. McCall (*Jour. Agr. Research [U. S.], 30 (1925), No. 9, pp. 819–831, figs. 6*).—Studies conducted at the Washington Experiment Station are reported, which showed that the soil mulch has an inhibitory effect on moisture absorption

under conditions where individual rains are not of sufficient volume to fully penetrate the mulch.

The mulch inhibits absorption by increasing the amount of current evaporation in the newly fallen moisture. The volume weight of the stirred mulch being less than that of an equal depth of unstirred soil, the moisture content of the mulched soil immediately after a rain is higher on a percentage basis. When conditions favor evaporation a greater total loss from the mulched soil results. The final moisture content is due to a cumulative effect following several rains. The soil mulch prevents the loss of moisture already in the soil by checking evaporation.

The practical use of the soil mulch in moisture conservation is considered to be dependent on climatic conditions which influence the prominence of either the inhibitory effect on absorption or the positive effect on retention, or which may nullify either or both.

Mercer County soils, R. S. SMITH, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 29 (1925), pp. [2]+64, pls. 2, figs. 7*).—This survey deals with the soils of an area of 350,713 acres in northwestern Illinois. It presents striking variations in topography. The prairie areas vary from flat in the northern part of the county to strongly undulating or rolling in the southern part. The drainage is said to be good.

The soils are grouped as upland prairie, upland timber, terrace, and swamp and bottomland soils. The majority of the soils are apparently of glacial origin. Twenty-six soil types are mapped, of which the brown silt loam upland prairie soil and the yellow silt loam upland timber soil cover 38.36 and 20.07 per cent of the area, respectively. Data on the plant nutrient content of the different soil types are presented, together with information on their fertility requirements and crop adaptations.

Information on the interpretation of the soil survey and on the general principles of soil fertility is appended, and a supplement containing experimental field data on four different important soil types is included.

Soils of Daniels County, L. F. GIESEKER (*Montana Sta. Bul. 174 (1925), pp. 32, pls. 4*).—A preliminary report of a survey of an area of 910,080 acres in the Great Plains area of northeastern Montana is presented, which was conducted in cooperation with the U. S. D. A. Bureau of Soils. The more prominent physical features of the county are the high plateaus with their more or less eroded gravelly slopes, the valley benches, the terminal moraines, and the intrenched stream area in the eastern part of the county. The county is mainly drained by the Poplar River and its tributaries. The soils are largely of glacial origin. Eight soil types of six series are mapped, of which the Daniels gravelly loam covers nearly one-third of the area.

The mineralogical examination of some Scottish soils, G. NEWLANDS (*Agr. Prog. [Agr. Ed. Assoc., London], 2 (1925), pp. 76–79*).—Methods of the mineralogical examination of certain Scottish soils used by the North of Scotland College of Agriculture are briefly described, and the results of such examinations are briefly set forth.

[Soil studies at the Pusa Research Institute], J. N. MUKERJI (*Agr. Research Inst., Pusa, Sci. Rpts. 1923–24, pp. 23, 24, 27, 29, 30, fig. 1*).—Further experiments on the available phosphate of calcareous soils (E. S. R., 51, p. 324) are briefly reported, indicating that the potassium carbonate method is capable of measuring the probable fertility of highly calcareous soils with reference to available phosphoric acid, and that it appears to be a decided improvement over the existing citric acid method.

In studies of the effect of superphosphate with green manure on calcareous soils, it was found that the inorganic phosphorus in mono- and dicalcic phos-

phates, when composted separately with lucern, combines with the organic matter of the lucern and forms organic phosphorus compounds. It is considered probable that under natural soil conditions phosphates in organic combination become more available to plants.

Studies on the relation of the clay content of soils to their moisture adsorption showed that the adsorption of moisture by a soil is dependent upn the clay content. The relation is subject to a deviation due to the difference in temperature of observations and in the character of the individual soils.

A continuation of the investigation on the movement of nitrates in the soil and subsoil (E. S. R., 51, p. 324) showed that the distribution of nitrates through the subsoil is determined by climatic factors and the physical character of the subsoil layers, and that the growth of the crop in turn depends to a considerable extent on the distribution of nitrate.

[Soil biological studies at the Pusa Research Institute], C. M. HUTCHINSON (*Agr. Research Inst., Pusa, Sci. Rpts. 1923–24, pp. 32–37*).—Further observations of the conditions under which nonsymbiotic nitrogen fixation takes place (E. S. R., 51, p. 417) showed that such fixation requires a supply of phosphoric acid in the form of mineral phosphates either as rock phosphate, basic slag, superphosphate, or pure tricalcium phosphate, or in the form of bone meal. The bone meal was found to give higher fixation figures than the mineral phosphates. The acidity of superphosphate appeared to have an adverse effect. Nitrogen fixation was increased by the addition of rotted organic matter to the soil. This increase was not obtained, however, if an excess of organic matter was used, owing apparently to a loss of nitrogen due to ammoniacal fermentation.

In field and pot culture tests of the capability of various substances to increase the amount and rate of nitrogen fixation in the soil, fermented straw was found to give greatly increased yields of maize as compared with cattle manure in equal quantities. The residual effect of the fermented straw on the following oat crop was also better than that obtained with cattle manure.

Sugar-cane trash added to soil did not appreciably increase the rate of nitrogen fixation, unless previously treated with a bacterial inoculum in the form of a water extract of cow manure. Rice dust as an organic manure was found liable to very rapid ammoniacal fermentation with consequent nitrogen losses, so that when used as a promoter of nitrogen fixation allowance had to be made for such losses and the ammoniacal fermentation reduced by proper attention to the water supply.

Nitrogen-fixing organisms in artificial cultures were found to gradually lose their nitrogen-fixing power. Two-thirds of the original power was lost in 19 months by Azotobacter, various nodule organisms, and certain aerobic manure organisms. Rejuvenation of the soil organisms could be obtained by inoculation into soil and subsequent recovery. The addition of mannite to the soil increased the rejuvenation effect with Azotobacter, and rotted organic matter produced a similar increase with the manure organisms. The nodule organisms, however, showed but little recovery after incubation in the soil.

Studies of pure cultures of several strains of the nitrate-forming organism showed that this organism is capable of living and functioning in the presence of large amounts of organic matter, provided the concentration of nitrite nitrogen is kept low. It was further found that the rapid and complete nitrification of bone manures could be obtained by previous fermentation before applying to the soil.

Studies of combined use of sunn hemp as a green manure and a source of fiber showed that cutting off and burying the tops of the plants in place of removing all the leaves from the stem gave equally good manurial results.

Experiments on a quantitative basis showed that bacteria in cultures, both pure and mixed, are able to assimilate large amounts of phosphoric acid from various sources, which are stored in the form of organic compounds as part of the bacterial cell.

The presence of urease in the nodules of various leguminous plants was demonstrated. This enzyme was not active in liquid cultures of the *radicicola* organisms, but was active in solid cultures on soil extract mannite agar. No urease was found in the roots of plants grown in sterile soil, whereas it was present in small amounts in the rôots of plants grown in normal soil. Further experiments suggested the conclusion that urease is developed as a result of the reaction between the *radicicola* organisms and the root tissues of plants not necessarily legumes. Some traces of the enzyme were also developed by the activity of such organisms as *Bacillus subtilis* in contact with plant roots.

Further studies of the solubilization of mineral and other phosphates showed that fermentation of bone meal as a preliminary to nitrification of its organic matter content, although giving more rapid and complete nitrification than in simple admixture with soil, involved some loss of nitrogen owing to the rapid ammoniacal fermentation produced. The addition of appropriate amounts of sulfur to the compost gave nearly double the amount of nitrate, presumably as a result of nitrification of the ammonium sulfate formed by interaction with the oxidized sulfur. A compost of bone dust, sulfur, and sand inoculated with a mixed culture of sulfur-oxidizing bacteria was found to contain citrate-soluble phosphoric acid to the amount of 94 per cent of its original content after a period of 23 weeks. An excess of sulfur as compared with phosphate in the compost was preferable to the reverse. Thus by gradual addition of bone meal to the compost better results were obtained than by gradual addition of sulfur.

[Soil experiments at the Wellcome Tropical Research Laboratories, Khartum], A. F. Joseph (*Wellcome Trop. Research Labs., Chem. Sect. Pub. 35 (1924), pp. 12–29*).—This report contains the usual progress data on mechanical and chemical studies of soils of the Sudan (E. S. R., 52, p. 120).

Studies of methods of making mechanical analyses indicated that the method using two hours' shaking and giving three puddlings with a camel's-hair brush is unsatisfactory with saline soils. Good results with heavy soils can not be obtained without puddling even when the salt content is low. Increasing the time of shaking does not improve the results in the case of a salty soil.

Studies on the effect of storage on moisture equivalent of soils gave a strong indication that moisture equivalent may increase with storage. A correlation between excessive moisture equivalent of heavy soils and low crop-yielding power was found to exist (E. S. R., 50, p. 421).

In experiments on the action of acids on clay it was found that if clay is allowed to stand in contact with acid for a day or two and then separated by centrifuging, it is unable to react with a fresh quantity of acid. If, however, it is purified from electrolyte its power of neutralizing acid is at least partially restored.

Studies on the action of alkalies on clay showed that with caustic soda the clay behaved like a weak acid, and that at a pH of about 10 the amount of alkali neutralized remained constant. Similar results were obtained with barium hydroxide in the presence of barium chloride. With calcium hydroxide in the presence of calcium chloride the results obtained were entirely different, the amount of base removed by a fixed quantity of clay showing no sign of reaching a constant maximum. Similar results were obtained by using sodium

hydroxide and calcium chloride. In both cases the amount of base taken up from the more strongly alkaline solutions was nearly twice as great as when sodium hydroxide was used in the presence of sodium chloride.

Data on the vertical distribution of salts in the soil showed that the gradient of salt content is very steep, being almost doubled in passing from a depth of 2 ft. 6 in. to 2 ft. 9 in. Data on the vertical movement of salts under irrigation indicated a marked tendency for the salts to move upward as the drying out proceeded. Data on the variation of salt content with depth during the period of 14 days elapsing between successive irrigations indicated that the salts in the first and second foot remained approximately constant, while the amount in the third foot increased at the expense of the lower layers. In studies on the effect of varying amounts of irrigation on the depression of salts, it was found that the displacement effect is more marked in soils receiving the larger quantity of water.

In experiments on the effect of sulfur in reducing alkalinity it was found that at the end of from 6 to 7 weeks the OH-ion concentration was reduced to one-sixtieth of its original value. At the same time the soluble salt content rose very greatly, but its moisture equivalent was reduced from 40.1 to 36.9. Studies on the influence of mechanical composition on the rate of evaporation indicated an increase in the rate of drying as the percentage of clay diminished.

Possible correction of certain soils of the south-east of South Australia, L. J. Cook (*Jour. Dept. Agr. So. Aust., 28 (1925), No. 9, pp. 807–813*).—Data on the correction of cementy ironstone loams in the Kybybolite district of South Australia are presented. Chemical analyses of samples of this soil indicated a large deficiency of phosphoric acid and a lack of lime in the soil and subsoil. The virgin soil is acid, but the clay subsoil is alkaline. Cropping and fertilizer practices are discussed.

The loss of nitrates from cropped soils, J. Hendrick (*Agr. Prog. [Agr. Ed. Assoc., London], 2 (1925), pp. 69–71*).—In a contribution from the University of Aberdeen and North of Scotland College of Agriculture, an account is given of the loss of nitrogen as nitrate in the drainage from the Craibstone drain gauges during the years 1919–1923.

The results indicate that the loss of nitrogen in the drainage from cropped soils is less than has generally been supposed. In addition, when nitrogenous manures are applied to such soils in ordinary amounts little or none of the nitrogen is washed away in the drainage even when the weather is very wet and a great amount of water is passing through the soil. Evidence is presented to show that the nitrate produced from such manures is taken up by the crops practically as fast as it is produced.

The Illinois system of permanent soil fertility in the light of twenty-five years of investigation, L. H. Smith (*Illinois Sta. Circ. 298 (1925), pp. 12, figs. 7*).—This is an address presented before the Illinois State Farmers' Institute at Paris, Ill., February 18, 1925, in which the present status of the Illinois system of permanent soil fertility is outlined on the basis of the results of 25 years of investigation at the station.

[Soil studies at the North Carolina Station], W. F. Pate (*North Carolina Sta. Rpt. 1924, pp. 40–44*).—Studies of muck soils have shown that corn grows best on this soil if it is kept distinctly acid. Sodium nitrate and potash are beneficial fertilizers when the acidity in both surface and subsoil is partially neutralized by lime, but acid phosphate has been found to be injurious to corn on this soil in most instances. Data from soil fertility experiments at different experimental farms in the State are briefly summarized.

The substitution of stable manure by fertilizers, green manures, and

(*1925*), *pp. 3–16*).—In a second contribution to the subject (E. S. R., 47, p. 419) the results of the third round and the averages of nine years of experiments are presented. The yields of the early crops were found to be larger with 16 tons of manure and fertilizer than with 32 tons of manure without fertilizer. Peat composted with lime, supplemented with fertilizer, and supplying the same amount of organic matter as 16 tons of manure produced 16 per cent greater yield in cabbages than 32 tons of manure alone, and 16 per cent less yield in tomatoes. A comparison of the best average yields with green manure modifications and fertilizer alone with those from 32 tons of stable manure alone showed that cabbages increased 30 per cent, total ripe tomatoes decreased 20 per cent, and celery decreased 24 per cent. Practically no advantage was gained by adding 8 tons per acre of stable manure with the green manure. Overhead irrigation was not advantageous on the rather compact silty loam soil.

Bone products and manures, T. Lambert (*London: Scott, Greenwood & Son, 1925, 3. ed., rev. and enl., pp. VIII+284, figs. 53*).—This is the third revised and enlarged edition of this book (E. S. R., 30, p. 221). It treats of the manufacture of fat, glue, animal charcoal, size, gelatin, and manures. The section on manures contains chapters on soils and plant life, natural manures, artificial manures, mineral phosphates, guanos, mineral manures, superphosphates, and special or mixed manures.

The agricultural value of some of the newer nitrogenous fertilizers, J. G. Lipman and H. C. McLean (*Amer. Fert., 62* (*1925*), *No. 4, pp. 25–28*).—The results of experiments at the New Jersey Experiment Stations indicate that among the more concentrated synthetic fertilizers urea is to be commended because of its high nitrogen content, its slight hygroscopicity, and its comparative safety. It is noted that urea made directly from ammonia and carbon dioxide is free from toxic substances, while urea made from cyanamide will contain varying amounts of dicyandiamide and guanylurea sulfate, which may cause injury to crops when present in larger proportions.

The sulphur factor in acid phosphate, H. C. Lint (*Amer. Fert., 62* (*1925*), *No. 10, pp. 21–24, fig. 1*).—A summary of data from various sources is presented, from which the conclusion is drawn that the uniformly satisfactory results from acid phosphate indicate that a part of its superior merit is due to the available sulfur carried by it.

Field crop response to the ingredients of potassium salts, B. L. Hartwell, S. C. Damon, and F. K. Crandall (*Jour. Amer. Soc. Agron., 16* (*1924*), *No. 10, pp. 660–665*).—Studies conducted at the Rhode Island Experiment Station are reported, the purpose of which was to use magnesium potassium sulfate, potassium chloride, potassium sulfate, and kainit under such conditions that not only the potassium but also the other ingredients should have an opportunity eventually to exert on crop plants any effect of which they might be capable.

During a 5-year test, when the average percentage increase due to the magnesium potassium sulfate was represented by 100, that with potassium sulfate equaled 109, with potassium chloride 113, and with kainit 135. Since sodium is useful when potassium is insufficient, the superiority of the kainit was considered to be due to the fact that it contained about twice as much sodium as potassium. If sulfur exerted any effect in the sulfate, it was apparently less than that exerted by the sodium and potassium chloride.

Commercial fertilizers, O. S. Roberts et al. (*Indiana Sta. Bul. 292* (*1925*), *pp. 60, fig. 1*).—Guaranties and actual analyses of 1,439 samples of fertilizers and fertilizer materials collected for inspection in Indiana during 1924 are reported.

AGRICULTURAL BOTANY

The relation of stored food to cambial activity in the apple, E. L. PROEBSTING (*Hilgardia* [*California Sta.*], *1* (*1925*), *No. 5, pp. 81–106, figs. 7*).—A report is given of the results of an attempt to determine, by defoliation methods, to what extent cambial activity and storage of food are correlated.

Defoliated apple trees, or halves of trees, showed a cessation of radial increase of wood within two weeks after defoliation, accompanied by a modification of the thickness of the walls of the cells laid down after defoliation. This phenomenon did not appear to be associated with a deficiency of stored food as indicated by analyses for reducing sugar, total sugar, starch, hemicellulose, and total nitrogen in the wood and bark.

Several alternative theories are suggested for the phenomena, among them enzyme inactivation, with consequent lack of certain end products of digestion necessary for growth; starvation, due to failure of the leaves to supply certain compounds directly, or to failure of translocation through short distances; or lack of balance of carbohydrate-nitrogen ratio, calculated not on totals but on fractions that may prove to be more directly involved.

Cytological studies on the state of the oil in oleaginous seeds [trans. title], A. POLICARD and G. MANGENOT (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 25, pp. 1841–1844*).—The endosperm in seeds of Ricinus consists essentially of a "cell" filled with oil, not in droplets but in one large drop, entirely homogeneous except as containing in suspension some grains of aleurone but showing neither nucleus nor cytoplasm in response to the customary technique. In the mature seed, oil does not exist in the form of a very fine emulsion.

The state of the oil in oleaginous seeds [trans. title], P. DANGEARD (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 1, pp. 67–69, figs. 2*).—The author, referring to the statement of Policard and Mangenot, noted above, affirms that in the seed cells of Ricinus may be found nuclei or alveoli, each containing more or less centrally a group of aleurone grains somewhat corresponding to a vacuolar system, and a number of distinct oil globules constituting an oleaginous reserve for these seeds. This is capable, moreover, of being dissolved out to show the very fine containing cytoplasmic network, so that, in so far as concerns oil droplets, the classical conception of a very fine cytoplasmic emulsion may well be retained.

The state of the oil in the reserve cell of oleaginous seeds.—The seed in germination [trans title], A. POLICARD and G. MANGENOT (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 5, pp. 346–348, figs. 3*).—The endosperm as seen in nongerminated seeds of Ricinus is dealt with in the article noted above. The present account describes modifications of that arrangement occurring in the course of germination during which, it is stated, change phenomena in a sense reversing those of maturation occur. These are briefly detailed.

Soluble carbohydrates in growing wheat grains [trans. title], H. COLIN and H. BELVAL (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 5, pp. 343–346*).—Changing values and ratios of different carbohydrates in growing wheat are tabulated for part of the growing seasons of 1922 and 1923.

Solubility [and insolubility] of starch [trans. title], G. MALFITANO and M. CATOIRE (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 24, pp. 1309–1311*).—Facts observed in connection with solubility or insolubility of starch are regarded as related to the presence or absence of substances named, usually classed as inorganic.

Recent studies on the movement of inulin in grafts of Compositae [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 22, pp. 1135–1137*).—Studies cited by the author have shown that species living in symbiosis depend upon one another, and that their physiological functions vary according to the associated species, the organs chosen for the tests, the particular associations realized during the tests by the operator, and the conditions of the medium.

Recent studies on the influence of hexamethylenetetramine and of formic aldehyde on bean [trans. title], E. and G. NICOLAS (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 21, pp. 1062–1064*).—Hexamethylenetetramine, absorbed under natural conditions, is said to act as an alkaloid. It was assimilated in these experiments in conformity with the results of experimentation previously noted (E. S. R., 53, p. 521).

Assimilation of ammonia by higher plants [trans. title], PRIANICHNIKOV (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 14, pp. 603–606*).—A certain parallelism observable in agriculture between the energy of nitrification and the development of plants is due to causes which are secondary in character. Whatever interferes with nitrification, as acid soil reaction or insufficient aeration, hinders at the same time the development of higher plants, and vice versa, so that nitrification is an important criterion as to the state of the soil; but ammonia introduced into the soil in suitable form may be directly utilized by the plant before undergoing oxidation and may act as a source of nitrogen superior even to nitrates.

Nitrogen fixation by non-leguminous plants, R. M. SNYDER (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 34–36, figs. 2*).—The author reports the occurrence of nodules on the roots of the Russian olive tree and also on *Ceanothus americanus*. In the case of the latter shrub, a bacterium-like organism was found to cause the nodules, and nodulated plants are said to have a higher nitrogen content than those not bearing nodules. The cause of the nodules on the Russian olive was not determined.

Symbiosis in the Orchidaceae [trans. title], J. WOLFF (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 13, pp. 554, 555*).—Noting the views of Bernard (E. S. R., 22, p. 722), regarding certain changes in the relations between orchids and fungi, the author details a study of *Rhizoctonia* sp. in connection with *Cattleya* sp.

The mitochondrial origin of anthocyanic pigments in flowers and leaves [trans. title], J. POLITIS (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 2, pp. 137, 138*).—The results of views held by others referred to as bearing upon his own conclusions, previously announced (E. S. R., 27, p. 634), having led to a resumption of his earlier work, the author states that in floral organs anthocyanin is formed in three ways, which are outlined, as by a cyanoplast, by numerous chondriocontes, and in numerous granular mitochondria, and that in leaves anthocyanin is formed by numerous mitochondria and also by a special body, the cyanoplast.

The formation of glucoside (saponarin) in mitochondria [trans. title], J. POLITIS (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 4, pp. 280–282*).—The author limits the present account to saponarin (said to have been determined by G. Barger in 1902 in *Saponaria officinalis*[1]), as found in *Thymelaea hirsuta* and *T. tartonraira*. Saponarin is said to be found in the mitochondrial structures and to be soluble under certain conditions in the vacuolar sap. It is supposed to be a product of mitochondrial activity, formed in a way similar to that in which anthocyanin is formed.

[1] Ber. Deut. Chem. Gesell., 35 (1902), pp. 1296–1298.

The evolution of a chondriosome in the embryonic sac of the Liliaceae [trans. title], A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 22, pp. 1138–1140, figs. 5*).—The author has succeeded in following in a very precise manner in the embryonic sac of the Liliaceae the evolution of two sorts of chondriosomes in all stages of their development.

Influence of gravity in phototropism [trans. title], H. RICÔME (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 21, pp. 1064–1066*).—Orientation factors in plant growth are discussed as to their relative influences and the manner in which they are exerted.

Specific action of luminous rays of various colors in photosynthesis [trans. title], V. LUBIMENKO (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 14, pp. 606–608*).—Studies outlined with plants subjected to sunlight of wave lengths of from 400 to 480 μμ (violet blue) and 600 to 700 μμ (red), with precautions to eliminate temperature effects, are said to show that the energy of photosynthesis varies greatly according to species. In general, photosynthetic energy weakens greatly with time in red, as also in blue violet, and this is due not alone to the accumulation of carbohydrates, but also to the direct action of light on the chlorophyll apparatus. In most cases photosynthesis in violet blue is sensibly lower in proportion to the quantity of energy actually absorbed; and it is only in species adapted to weak diffused light, as Aspidistra or Hedera, that the activity of the blue violet equals that of the red rays. Evidently, despite a considerable resemblance in the absorption by various species, there exists a specific adaptation to the spectral make-up of the irradiation. Mostly, red rays are utilized for photosynthesis, but the species adapted to diffused light, relatively poor in red rays, make a compensating use of the shorter waves. It is therefore probable that, for a given natural complex illumination, rays of different colors exert specific influences in the photochemical reaction associated with chlorophyll assimilation.

The claim regarding formation of chlorophyll in darkness [trans. title], H. COUPIN (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 4, pp. 279, 280*).—The author states that of a number of higher plants examined not one produced chlorophyll when grown in absence of light. He considers the claim still sometimes made that plants grown in darkness may form chlorophyll to be incorrect, except that he admits the possibility of chlorophyll formation by plantlets of pine and by unicellular algae, as reported by Dangeard (E. S. R., 46, p. 724).

Influence in green plants of leaf injuries upon the production of dry matter [trans. title], V. LUBIMENKO (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 16, pp. 708–711*).—Reduction of leaf surface in *Raphanus sativus* was followed by an increase in the production of dry substance relatively to leaf area. This fact is thought to indicate that under ordinary conditions the plant does not utilize all of its functional capability, also perhaps that under the influence of traumatism photosynthesis is augmented.

Some effects of freezing on mature fruits of the apple, D. B. CARRICK (*New York Cornell Sta. Mem. 81 (1924), pp. 3–54, pls. 7, figs. 5*).—As a contribution to the study of the cold storage of apples, the author investigated the initial freezing point of the cell sap in contact with the protoplasm, as well as the effect of subsequent degrees of freezing upon the tissue.

By means of special apparatus, which is described, freezing point determinations were made of 1,552 apples representing 10 varieties, and the freezing point range was determined as extending from −2.85 to −1.02° C. The minimum average depression was −2.6° in Baldwin apples and the maximum average depression was −1.54° in Wagener.

The point of ice formation and the lethal point in apple tissue were not identical. It is claimed that the latter may be less than 1° lower than the freezing point, but in some cases there is a difference of nearly 3°.

Observations showed some difference in the freezing points of different tissues in the same fruits, but the variations were considered of little significance.

Rapidly frozen apples are said to exhibit a larger amount of discoloration than do similar fruits requiring four times as long an interval to reach the same minimum temperature. Apples frozen rapidly to varying degrees, when thawed at 0° and 22° showed an equal amount of browning injury. However, slowly frozen apples when thawed very slowly during several days or weeks at 0° uniformly revealed more discoloration than if more quickly thawed at 10° or higher.

Freezing points of expressed apple juice, measured by a Beckmann apparatus, were found to be significantly higher than the depression of the cell sap within the normal, unfrozen apple tissue as determined by thermojunctions. The depression of the cell sap within the tissue frozen to death was much higher than the Beckmann measurements.

Various external and internal symptoms of frozen apples, such as changes in color, the effect of bruising while ice is present, and the texture and flavor, are described.

Slightly frozen apples were found more susceptible to *Penicillium expansum* and other fungus organisms than normal fruit, and they did not keep so well in storage. It was found that severely injured apples could not be kept for any length of time without loss, and the author claims that they should either be disposed of immediately or placed in storage at —20°. At this low temperature it is claimed the fruit can be kept almost indefinitely and remain satisfactory as a culinary product, although worthless for fresh consumption.

Preliminary experiments with the Wagener, Baldwin, Rome, and Ben Davis varieties are said to indicate that —1° or somewhat below this point is the optimum temperature for the cold storage of the apple.

Modifications caused by alpine climate in floral morphology and anatomy [trans. title], M. LARBAUD (*Ann. Sci. Nat., Bot., 10. ser., 5 (1923), No. 5–6, pp. 193–319, pls. 10, figs. 41*).—The numerous general conclusions which are deduced from this extensive study as here detailed are grouped under the heads date and duration of flowering, external morphology of the flower, and anatomy of the different floral parts. Seventy-five bibliographical citations are given.

Experimental pollination: An outline of the ecology of flowers and insects, F. E. CLEMENTS and F. L. LONG (*Carnegie Inst. Wash. Pub. 336 (1923), pp. VII+274, pls. 17*).—The primary object of this investigation is to place the study of the flower in relation to its environment on the basis of experiment and measurement. The central theme is the attraction and the behavior of the insect at the flower.

Seeds and plants imported by the Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry, during the period from January 1 to March 31, 1923 (*U. S. Dept. Agr., Inventory 74 (1925), pp. 42, pls. 4*).—A list is given, together with descriptive notes, of 646 lots of seeds and plants introduced for testing in the United States.

Monograph of mistletoe, K. VON TUBEUF, G. NECKEL, and H. MARZELL (*Monographie der Mistel. Munich: R. Oldenbourg, 1923, pp. XII+832, pls. 40, figs. 181*).—With the aid, in portions indicated, of his collaborators, von Tubeuf has embodied here the results of wide research on the European mistletoe, *Viscum album*, giving some account also of certain relatives of that species.

GENETICS

Carpoxenia and bud mutations in cultivated citrus [trans. title], TRABUT (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 11, pp. 772–774*).—Bud mutations are said to be very common in citrus, being comparatively frequent and important in case of the navel group having sterile stamens. These mutations are often advantageous and are used to advantage, but very often they give rise to fruits that are undesirable, so that they should be eliminated from culture.

Cross-pollination, which sometimes gives rise to carpoxenia, probably may determine also cladoxenia through some influence exerted, supposedly, on buds arising or appearing later in close proximity to the xeniated fruit. In this way may originate, it is thought, some of the bud mutations which are observed.

A minute-like III-chromosome recessive in Drosophila melanogaster, O. L. MOHR (*Brit. Jour. Expt. Biol.*, *2* (*1925*), *No. 2, pp. 189–198, fig. 1*).—The author reports on the occurrence and breeding at the Christiania University of a factor in *D. melanogaster* resembling in its action the dominant minute mutations, but which breeding tests showed to be recessive and located in the third chromosome. The homozygous female flies showed a low fertility, with delayed emergence and lowered viability. This was so pronounced that matings with homozygous males were practically sterile, but were not so marked when mated with nonrelated males.

The hereditary relationship of earlessness and short ears in sheep and **the production of this type in Norway** [trans. title], C. WRIEDT (*Ztschr. Induktive Abstam. u. Vererbungslehre, 36* (*1925*), *No. 3–4, pp. 430–437, figs. 4*).—The author cites the results of experiments which indicate that the earless condition in sheep is recessive to the normal, while the heterozygous condition produces short-eared sheep. The earless and short-eared sheep have been found to be somewhat widely distributed in Norway.

Mosaic heredity [trans. title], L. BLARINGHEM (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 24, pp. 1734–1737, fig. 1*).—For a number of years the author has given attention to facts and forms encountered bearing upon what is termed mosaic inheritance (E. S. R., 30, p. 335). The facts here cited with brief discussion were obtained from study of *Cardamine pratensis*.

Selection in self-fertilized lines as a means of improving timothy, H. K. HAYES and S. E. CLARKE (*Sci. Agr.*, *5* (*1925*), *No. 10, pp. 313–317, figs. 2*).—Determination of the average seed-setting per head of 41 timothy plants, representing different apparent abilities to set seed under conditions of self-pollination, and from several plants for each progeny of the 41 at the Minnesota Experiment Station in 1923 and 1924, respectively, indicated that seed setting under conditions of self-pollination is probably due to genetic causes. The actual number of seeds set ranged from almost 0 to 66 seeds per spike as an average for an individual plant. Self-fertilization in timothy does not lead to as great reduction in vigor as observed in corn. Some selfed lines yielded less and others considerably more than the average for the commercial variety.

Correlated inheritance of botanical characters in barley, and manner of reaction to Helminthosporium sativum, F. GRIFFEE (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 10, pp. 915–935, pls. 2, fig. 1*).—Genetic investigations at the Minnesota Experiment Station were concerned with the interrelations of the various character pairs of barley with the aim of establishing a linkage group for each chromosome pair. Results are reported from studies of several

generations of the crosses Svanhals (*Hordeum distichon*) ×Lion (*H. vulgare*) and *H. deficiens steudelii* × Manchuria (*H. vulgare*).

Cytological studies showed that each of the cultivated barley species, *H. vulgare*, *H. intermedium*, *H. distichon*, and *H. deficiens*, has 14 somatic chromosomes, and accordingly, 7 linkage groups are expected.

Each of the character pairs, 2-rowed v. 6-rowed, *deficiens* v. 6-rowed, black v. white glumes, early heading v. late, rough awn v. smooth, and intermediate-smooth awn v. smooth, was found to differ by a single genetic factor. In Svanhals×Lion the character pairs black glumes v. white, 2-rowed v. 6-rowed, rough awn v. smooth awn, and intermediate-smooth awn v. smooth were found to be independent of each other in inheritance. Black glumes v. white glumes and *deficiens* v. 6-rowed were found to be independent character pairs in *H. deficiens steudelii* × Manchuria.

Resistance and susceptibility to *Helminthosporium sativum* are due to definite genetic factors. At least three factors seem to be concerned in the production of resistance of the type possessed by Svanhals. One factor was observed to be linked with the factor for 2-rowed, one with the factor for rough awn, and one with the factor for white glumes.

The factor for early heading was found to be linked with that for 6-rowed but with a very low intensity. The linkage of the factor for susceptibility to Helminthosporium with the factor for earliness is much more intense than that with the factor for 6-rowed, else earliness in itself predisposes the plant to attack by the pathogene.

Inheritance of chemical characters in crosses of dent and sweet corn (*Iowa Sta. Rpt. 1924, p. 40*).—Preliminary studies of the mode of inheritance of carbohydrates in crosses between varieties of field and sweet corn showed that high sugar and dextrin content are distinctly recessive in inheritance. The carbohydrate and fat values are interrelated genetically, which seems to indicate a fundamental chemical relation.

Interspecific hybrids between Raphanus sativus and Brassica oleracea [trans. title], G. D. Karpechenko (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 5–6, pp. 390–410, figs. 8*).—Observations upon 123 hybrids of *R. sativus* ♀ × *B. oleracea* ♂ showed great variability in the vigor, habit of growth, leaves, and flower color of the F_1 generation. However, in respect to the form of the floral parts and in the fruit, the hybrids were uniformly intermediate between the two parents. The roots of the hybrids formed swellings and leaf-bearing shoots in a similar manner to hybrids between *B. napus* and *B. rapa*.

Division in the somatic cells was found to occur in a normal manner, while in the reduction division of the pollen mother cells the following abnormalities were noted: (1) Chromosomes did not combine in the diakinesis, (2) their distribution in the first and second division was irregular, and (3) in addition to tetrads there were formed groups of 2, 3, and even 7 cells. Only a few of the parent cells reached full development, the majority degenerating. The hybrids when intercrossed or crossed back to their parental forms manifested sterility.

Attempts to make the reciprocal cross, *B. oleracea* ♀ × *R. Sativus* ♂, were unsuccessful.

New facts regarding hybrids of Triticum and Aegilops [trans. title], L. Blaringhem (*Compt. Rend. Acad. Sci.* [*Paris*], *176* (*1923*), *No. 12, pp. 852–854*).—The quantitative and qualitative results of cross-pollination, and particularly between *Aegilops* spp. and *Triticum* spp., during 1920–1922 are detailed, with discussion of its bearings and with an account of the observed occurrence of Xenia.

A mosaic of sexes in a hybrid of wild sorrel [trans. title], L. BLARINGHEM (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 1, pp. 69–71*).—Out of more than 1,000 flowers of *Rumex acetosa*, dusted abundantly with pollen of *R. scutatus*, there were obtained 7 hybrids, very vigorous, of the type *acetosa*, and so considered as clear examples of unilateral (maternal) inheritance. The male individuals had a small number of hermaphrodite flowers, the arrangement of which appeared to be related to a certain plethora localized in the middle portion of the axis (stem).

On sex chromosomes, sex determination, and preponderance of females in some dioecious plants, Ö. WINGE (*Compt. Rend. Lab. Carlsberg, 15* (*1923*), *No. 5, pp. 26, pls. 4*).—Sex chromosomes are shown to exist in *Humulus lupulus*, *H. japonicus*, *Melandrium album*, and *Vallisneria spiralis*, the male plant being heterogametic in all four species. In the first three the male plant has a pair of chromosomes with partners of unequal size, an X- and a Y-chromosome, in addition to the autosomes. Vallisneria has in the male an odd number of chromosomes in somatic cells. One of these is an unpaired, X-chromosome divided by constriction into two in a peculiar manner. Not only the Lygaeus but also the Protenor type is thus shown to exist in the plant kingdom.

The sex chromosomes found are supposed to be sex determining under normal conditions, XX individuals being female, XY (or XO) individuals being male. The autosomes must also, however, as in case of Drosophila in the animal kingdom, be regarded as bearers of the tendency to male and probably female organs.

Results of countings of male and female are given, from experimental material comprising *Cannabis sativa*, *H. japonicus*, and *H. lupulus*, all three, especially the last, showing a marked preponderance of female plants.

Sex-determination, F. A. E. CREW (*Nature* [*London*], *115* (*1925*), *No. 2894, pp. 574–577*).—A brief review of the present knowledge on this subject.

The possibility of sex control by artificial insemination with centrifuged spermatozoa, J. L. LUSH (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 10, pp. 893–913, figs. 14*).—In efforts to control sex in rabbits at the Wisconsin Experiment Station, semen was centrifuged, and portions removed from the top and bottom of the centrifuge tubes were used for the artificial insemination of does. The semen was collected by a catheter and bulb from the vagina and uterus of females immediately following from 1 to 5 services by a buck. In some cases the semen was diluted with Ringer's solution prior to centrifuging, and in other cases this solution was used to help wash the spermatozoa from the genital tract of the females.

The only deviation from equality in the sex which appeared significant was in the offspring of does which had been served normally, but from the genital tract of which as much semen had been removed as possible. The actual numbers of this type were 170 males to 205 females. Due to the inability of furnishing a satisfactory explanation for a modified sex ratio, the author is inclined to reserve judgment on the influence of this practice.

The data are tabulated with respect to the influence of other factors on the sex ratio such as the length of gestation, lethal factors carried by individual male or female parents, dilution of the semen, speed and duration of the centrifuging process, and the number of copulations of the male, but no significant effect was observed.

Microscopic examinations were made of the motility of the sperms and of their size. This study indicated that a dimorphism in the size of the sperms probably exists, but the difference was found to be slight and could not be established without doubt. It was further uncertain from this study whether centrifuging did or did not tend to separate the sperms according to size.

Microscopic studies of swine semen indicated a slight difference in the size of the spermatozoa and further that the sizes could be partially separated by the centrifuging process.

Certain physiological findings brought out in the investigation are also presented. A bull's testicle kept in the refrigerator was found to yield a few motile sperms up to and including the eighth day. Spermatozoa in semen kept at from 0 to 20° C. were also motile for as long as 60 hours, especially when kept at the lower temperature. Bacterial development tended to inhibit the motility of the sperms. The presence of urine in semen also tended to injure seriously the activity of the spermatozoa.

A study of the effect of the different methods of breeding and treatment of the semen yielded somewhat variable results. It is of interest that coition did not appear to be necessary for ovulation in the rabbit, as litters were produced by the artificial insemination of four does which had not delivered litters or copulated within 13 days before or 10 days after fertilization. Though the results of the investigation were negative as to the control of sex, they do not furnish any evidence against the chromosome theory of sex control.

A review of the literature on the sex control is included.

The sex ratio in litters of mice classified by the total amount of prenatal mortality, E. C. MACDOWELL and E. M. LORD (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 389, 390*).—Four hundred and forty-five litters of mice were classified in five groups according to the amount of prenatal mortality occurring in each litter. Prenatal mortality was determined by the difference between the corpora lutea counts, according to the methods previously described (E. S. R., 52, p. 631), and the number of young born. The sex ratios were determined within each class and found to be 100 or over in all classes except in that showing from 80 to 100 per cent of prenatal mortality. In this class the sex ratio was 63.6, but here the numbers of offspring were very small. The authors believe that no evidence of selective male mortality is revealed.

Selective elimination of ova in the adult ovary, E. ALLEN, W. B. KOUNTZ, and B. F. FRANCIS (*Amer. Jour. Anat., 34 (1925), No. 3, pp. 445–466, pl. 1, fig. 1*).—This is the complete report of the work noted from an abstract (E. S. R., 52, p. 630).

Observations on the functional compensatory hypertrophy of the opossum ovary, C. G. HARTMAN (*Amer. Jour. Anat., 35 (1925), No. 1, pp. 1–24*).—In 31 female opossums from which one ovary and one uterus were removed, it was found that a compensatory hypertrophy of the other ovary resulted in 25 cases. This hypertrophy averaged three times the normal size, the variation being from 1.5 to 8.5 times the normal. The increase in size was due to an increase in the number of Graafian follicles present, and the average number of ova discharged or about to be discharged in 11 surviving ovaries was 30 as compared with 11 for a single ovary in control animals having two ovaries.

Hysterectomy and the oestrous cycle in the opossum, C. G. HARTMAN (*Amer. Jour. Anat., 35 (1925), No. 1, pp. 25–29*).—Hysterectomy in 9 opossums at the University of Texas resulted in no interference in the normal rhythm of the oestrous cycle. A short stump of the cervix ligatured with a cotton thread was left in each hysterectomized animal.

Degenerative changes in the unfertilized uterine eggs of the opossum (Didelphis virginiana), with remarks on the so-called parthenogenesis in mammals, S. C. SMITH (*Amer. Jour. Anat., 35 (1925), No. 1, pp. 81–103, figs. 39*).—A study of approximately 500 unfertilized ova removed from the uteri of 65 pregnant or pseudo-pregnant animals has revealed no evidence of partheno-

genetic development. In conducting the study, 298 eggs were sectioned and it was found that the fragmentation begins as soon as the unfertilized egg reaches the uterus. The ovum first flattens, then becomes crescentic, and no normal cleavage occurs.

Birds without gonads: Their origin, behaviour, and bearing on the theory of the internal secretion of the testis, O. RIDDLE (*Brit. Jour. Expt. Biol., 2 (1925), No. 2, pp. 211–246*).—The author has individually described in pigeons from the Carnegie Station for Experimental Evolution at Cold Spring Harbor, N. Y., the occurrence of 16 birds which were found to lack gonads entirely, 17 birds in which the gonads were almost absent, and 15 birds in which one gonad was absent. The factors contributing to these abnormal conditions are discussed, and it is concluded that the deficiencies were not temporary or due to disease, but resulted from physiological disturbances during development rather than genetic or cytological disturbances. Some of the birds showing complete absence of gonads evidenced a complete and emphatic masculine behavior, with variations in the secondary sex characters.

Further evidence indicated "that the gonad incretions are 'controlled' as well as controlling factors in sex development. That they, like the chromosomal or genetic sex factors, rest upon the more basic condition which we elsewhere *identify as metabolic level or rate.*"

Studies on vigor.—II, The effect of castration on voluntary activity, R. G. HOSKINS (*Amer. Jour. Physiol., 72 (1925), No. 2, pp. 324–330, fig. 1*).—In studies at the Ohio State University, the activity, as measured in revolving cages, of 16 castrated rats was compared with the activity of a like number of controls. The 32 animals were first observed for two weeks as to their activity, after which one-half were castrated—at about 70 days of age. Activity records were kept for 100 days after the operation. Trauma and anesthesia caused a slight decrease in the activity of the castrated animals during the first 10 days following the operation, but the initial decrease due to castration was apparent in from 5 to 26 days when individuals were compared with their controls. The most frequent time was about 12 days. The control animals showed rapid increases in their activity up to the fiftieth day after the other animals were castrated. This maximum activity was followed by a subsequent decrease throughout the rest of the experiment. The castrated animals showed a small but gradual decrease throughout.

FIELD CROPS

A method of eliminating experimental error in comparative field tests, C. R. ORTON and O. OLSON (*Pennsylvania Sta. Bul. 193 (1925), pp. 14, 15, figs. 2*).—Distribution of unit groups of plants by means of "magic squares" of various orders is described briefly and illustrated.

[Agronomic investigations in Arizona, 1922], G. E. THOMPSON, R. S. HAWKINS, S. P. CLARK, F. J. CRIDER, A. F. KINNISON, and D. W. ALBERT (*Arizona Sta. Rpt. 1922, pp. 198–207, 226–228, figs. 3*).—Varietal trials with corn, wheat, barley, oats, rye, grain sorghums, sorgo, millet, soy beans, cotton, potatoes, and miscellaneous grasses and legumes; fertilizer tests with sorghum, wheat, and cotton; planting trials with cotton, soy beans, and potatoes; a topping test with cotton; and alfalfa germination tests are reported on as heretofore (E. S. R., 48, p. 434).

Tepary beans were the most satisfactory of the green manure crops tested, although Otootan and Barchet soy beans gave excellent results on the Salt River Valley farm. Inoculation has not increased legume yields at this farm as

at the Sulphur Spring Valley dry farm, although inoculation of vetch seed has greatly increased yields in the sandy soils of the Yuma mesa.

Spring-grown seed potatoes yielded nearly twice as much as fall-grown seed and produced a higher percentage of marketable tubers. Irish Cobbler, Triumph, and Peerless produced the most marketable stock. Early plantings also gave the highest yields with the most mature marketable tubers.

Pruning vines reduced the yields of Porto Rico and Nancy Hall sweet potatoes 83.4 and 35.4 per cent, respectively. Sweet potatoes left undug at Yuma were in perfect condition when dug in March. Excessive irrigation reduced yields 16 per cent, and the sweet potatoes were irregular in shape with a high percentage of culls.

Plant breeding, W. E. Bryan and E. H. Pressley (*Arizona Sta. Rpt. 1922, pp. 234–238*).—Study of 45 first seed generation progenies from commercial hairy Peruvian alfalfa (E. S. R., 48, p. 433) gave evidence that the various types found growing in the same commercial field arose through admixture with seeds of other types of alfalfa during threshing and recleaning, and perhaps through other agencies. The uniformity shown by each progeny suggests that the amount of crossing between adjacent fields of alfalfa by means of insects is almost negligible.

The acre yields of seed cotton from long staple upland varieties did not differ materially from yields of short staple upland cottons, although, excepting Trice, the latter outranked the long staples in lint percentage.

In milling and baking tests with pedigreed strains of Arizona-grown wheats, Early Baart, Bunyip, and Pusa led in volume of loaf and had high color and texture scores. Unsatisfactory results obtained with Marquis and Turkey wheats were in accord with those of previous tests, showing conclusively the impossibility of obtaining good baking flours from the wheat of the humid eastern States grown under southwestern irrigation conditions. Hardness of grain alone was found to be a very unreliable guide in making selections to produce good baking flours.

[Agronomic experiments in Iowa, 1924] (*Iowa Sta. Rpt. 1924, pp. 10–12, 34*).—Alfalfa root studies showed very little difference under Iowa conditions in the character of the root of common alfalfa as compared with Grimm, Baltic, and Cossack. The hardy varieties had slightly more plants with divided tap roots but not enough to be of use in variety identification.

It was found that a mixture of mustard seed in rape can be detected accurately and with certainty by moistening a representative lot of seed and mixing it with dry sawdust. The mustard seed coat becomes mucilaginous when moistened, and the sawdust adheres to it but not to the rape seed.

Wood clover, *Dalea alopecuroides*, has usually been satisfactory on some of the lighter, less fertile soils, and especially those inclined to be sandy or low in organic matter, whereas seedings on rich, black loam soils were often quite inferior. Mung bean, soy beans, cowpeas, velvet beans, and Dalea have made satisfactory growth in southern Iowa on an acid soil which would require from 3.5 to 4 tons of lime.

Weeds whose seeds survived outdoor burial for 12 years included velvet leaf, jimson weed, horse nettle, catnip, and the seeds of honey locust, for 10 years five finger, 9 years curled dock, 8 years tumbling pigweed, 7 years burdock, 6 years lamb's-quarters, and 5 years Dalea, field thistle, and evening primrose.

[Field crops investigations in North Carolina, 1923–24], R. Y. Winters (*North Carolina Sta. Rpt. 1924, pp. 12, 18, 19, 22, 23, 29–31, 34–37, figs. 2*).—Experiments (E. S. R., 51, p. 831) reported on from the station and substations included varietal tests of corn, wheat, oats, barley, rye, soy beans,

lespedeza, and vetch; a source of seed test with crimson clover; fertilizer tests on corn and rotations; and seeding tests with wheat and oats. Improvement work has been carried on with corn, wheat, rye, cotton, sorgo, and soy beans.

Outstanding among results obtained at Oxford were the effects of magnesium limestone in controlling "sand drown" and in increasing the yield and quality of tobacco. The average in increase in yield and value of limed plats over unlimed plats during four years has been 174.5 lbs. and $55.82 per acre.

Seed potatoes grown in western North Carolina were found superior to northern-grown seed for the spring crop in eastern North Carolina.

The iron, chlorine, and sulfur contents of grains and the influence of irrigation water upon them, J. E. Greaves and D. H. Nelson (*Soil Sci., 19 (1925), No. 4, pp. 325–330*).—Analyses at the Utah Experiment Station of numerous samples of wheat, oats, and barley (E. S. R., 51, p. 530) composited from several crops grown on soil receiving different quantities of irrigation water, revealed that the iron and chlorine contents of wheat increased with the quantity of water applied during the growing season. Wheat grown with 35 in. of water contained 1.69 times as much iron and 2.7 times as much chlorine as did unirrigated wheat. Irrigation did not affect the iron content of oats and barley, and their chlorine contents were not related to the amount of water applied.

The sulfur content of wheat rose as more irrigation water was applied, the increase being largely oxidized sulfur, whereas an irregular decrease occurred in oats and barley. Apparently grains may carry considerable quantities of oxidized sulfur.

The relation of sulphur to alfalfa production, O. C. Bruce (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 937–947, pls. 3*).—Sulfur, inoculated sulfur, acid phosphate, lime, complete fertilizer, and manure were applied singly and in combinations to alfalfa on Oswego silt loam at the Kansas Experiment Station. The type of soil used in the experiments contained as much of the common fertilizing elements as the average Kansas soil and had slightly more sulfur.

Sulfur applied to alfalfa gave no marked increase in yield or root development, indicating that it is not the limiting factor in alfalfa production on the soil type used. Sulfur generally increased the acidity of the soil, showing that the sulfur should be supplemented with lime. The nitrogen content of the tops and the sulfur content of roots and tops were not affected by the sulfur applied, and neither did a material increase in root development nor any increase in number or size of nodules on the roots follow as a result of sulfur applications.

Does artificial tripping of alfalfa blossoms increase seed-setting? W. D. Hay (*Sci. Agr., 5 (1925), No. 9, pp. 289, 290*).—Studies at Lethbridge, Alta., indicated that neither lack of tripping, time of tripping, nor color of flower appreciably influenced seed setting in alfalfa.

Fertilizing corn in 1924, C. E. Thorne (*Ohio Sta. Mo. Bul., 10 (1925), No. 5–6, pp. 67–72*).—The 1924 acre-yield of corn in rotations receiving various fertilizers and lime (E. S. R., 45, p. 232), at the station and at the Cuyahoga, Montgomery, and Clermont County Experiment Farms, are tabulated and discussed in comparison with averages for different periods of years.

The experiments are held to have demonstrated the possibility of producing large yields of corn over long periods with the aid of clover, chemical fertilizers, and lime. In connection with other tests they indicate that acid phosphate may be used with the certainty of an eventually profitable return on practically every Ohio soil. In all these tests the fertilizers for corn have

been broadcasted. When so used the residual effect on the small grains and clover that should follow the corn will pay for the fertilizer, leaving the increase of corn as clear gain. While the fertilizers were applied just before planting, profit might also follow their distribution between the rows after the corn is planted.

[Cotton investigations in North Carolina, 1923–24], R. Y. WINTERS (*North Carolina Sta. Rpt. 1924, pp. 31–34, 37, 38*).—Mississippi-grown cotton seed produced plants slightly taller at blooming and maturity and which were slightly earlier than those from North Carolina-grown seed. The seed produced in Mississippi were also larger, but large seed from North Carolina gave slightly earlier plants in North Carolina plantings.

Acid delinted seed germinated first, those rolled in ashes second, normal cotton seed third, and seed treated with sodium nitrate last. The treatments ranked in the same order as regards number of open bolls per acre and per plant and yield of seed cotton per acre. Acid delinted seed also excelled at Rocky Mount, while sodium nitrate delayed germination slightly with its heavier applications reducing the stand. Late April plantings produced the most seed cotton, and early bedded cotton outyielded freshly bedded plats. Unthinned plats have averaged highest at the first picking.

In the examination of fibers from Cleveland, Mexican Big Boll, King, Cook, and Rowden cotton grown under the same conditions, Winters and J. B. Cotner found considerable differences in the average diameters and tensile strength. Diameter and tensile strength were directly related, the varieties with the broader fibers having the greater breaking strength. Mexican Big Boll gave the greatest diameter, 22.576 μ, and the greatest strength, 54.54 dg.; while Cleveland furnished fibers of the least diameter, 18.836 μ, and a breaking strength of 31.43 dg. The correlation between diameter of fiber and tensile strength for all varieties was $r=+0.623\pm0.013$.

By using a new method (E. S. R., 51, p. 832) for determining the density of cotton fiber population on the seed coat Winters and L. I. Henning found that as the fiber population increased the diameter of fiber, the lint index, and percentage of lint increased, and the length of fiber and weight of seed decreased. Decrease in length was associated with increased diameter.

A study of the relation between length and diameter of cotton fibers conducted by Winters and P. J. Naude gave indications that as the length of fibers increase the lint percentage and diameter of fibers decrease. The correlation between length and diameter of fibers was -0.02929 ± 0.0356, and between length of fibers and lint percentage -0.265 ± 0.03621. Increase in size of seed was found to be slightly associated with longer fibers, $r=+0.11303\pm0.03845$.

In a study of the density of fiber population on the cotton seed coat and its relation to the twist in fiber, Winters and T. C. Chang observed that increased density of fiber population is definitely associated with increased number of twists per inch. Increased length was found to be associated with decrease in number of twists per inch. When the fibers were halved counts revealed that the end attached to the seed had the smaller number of twists per inch.

Cotton in South Africa, W. H. SCHERFFIUS and J. DU P. OOSTHUIZEN (*[Johannesburg]: South Africa Central News Agency, Ltd., 1924, pp. 207, pls. 41, fig. 1*).—Intended primarily as a handbook for cotton growers, with special reference to South Africa, this volume discusses the history and status of the crop in the world and South Africa, describes botanical and varietal characteristics and breeding methods, deals at length with production, ginning and

marketing practices, and comments on cotton seed and its products and insects and diseases and their control. Meteorological data and statistics are tabulated in conclusion.

The weights and measures of the cotton hair, W. L. Balls (*Empire Cotton Growing Rev., 2 (1925), No. 2, pp. 108–116, pl. 1*).—Comparisons are made of the size and structure of the fiber with discussion of intravarietal size variations and other fiber characteristics.

Comparative wearing qualities of Pima and ordinary cotton used in mail bags, F. R. McGowan, C. W. Schoffstall, and A. A. Mercier (*U. S. Dept. Com., Bur. Standards Technol. Paper 277 (1925), pp. 73–83, pls. 2, figs. 3*).—Laboratory and service tests showed that catcher pouches made from Pima cotton duck will give better service than those made from ordinary cotton duck and now being used by the U. S. Post Office Department. The Pima fabric withstood tearing strains incident to the service much better than the usual fabric. A suitable mill organization for the manufacture of yarn from Pima cotton was developed.

The Tangier pea, Lathyrus tingitanus, P. B. Kennedy (*California Sta. Circ. 290 (1925), pp. 15, figs. 10*).—The botanical characteristics and relationship of the Tangier pea are given, with notes on its history, and methods used in handling the crop for seed, green manure, and for forage.

Miscellaneous experiments with potatoes, B. A. Brown and W. L. Slate, Jr. (*Connecticut Storrs Sta. Bul. 126 (1925), pp. 35–41*).—Certified strains (E. S. R., 50, p. 32) of Green Mountain and of Irish Cobbler potatoes have averaged 63 and 19 bu., respectively, more per acre and both 10 per cent more of U. S. Grade No. 1 tubers than uncertified strains from the same regions. Certified Russet Rural strains yielded 39 bu. per acre more and 1 per cent more No. 1 tubers than uncertified strains in a 1-year test. Certified strains of Green Mountain potatoes had 23.8 per cent less plants infected with degenerative diseases, and Irish Cobbler 7 per cent less than uncertified strains. Certified Green Mountain and Irish Cobbler seed from Vermont and New York have given average yields surpassing those from Maine and Canada. The histories of the strains of potatoes in tests at the station show that Vermont and New York growers have been able to hold their strains much longer than Maine growers.

Peruvian guano replacing animal tankage in potato fertilizer decreased the total yields 64 bu. per acre (17 per cent) in a 1-year test.

The soybean in Ohio, L. E. Thatcher (*Ohio Sta. Bul. 384 (1925), pp. 33–68, figs. 2*).—The results of cultural experiments with soy beans in Ohio and elsewhere are assembled, together with information on general field and cultural practices, seeding and harvesting methods, varieties, soy beans in mixtures with corn and Sudan grass, and costs of production. Much of the Ohio work has been noted (E. S. R., 37, p. 235; 47, p. 634; 49, p. 333; 53, p. 339).

Investigations at the station showed that as the soy bean plant approaches maturity the store of nitrogen in the roots is rapidly reduced and that of the soil may be depleted similarly. The effect on the soil nitrogen seemed to increase with delay in harvest. Analyses by R. H. Simon in time of harvest tests showed that as the plant matures, nitrogen, phosphorus, and potassium move from the several parts of the plant to the seeds. The leaves and pods remain relatively high in calcium and magnesium throughout the life of the plant.

Better yields of seed and straw were obtained on plowed than on disked corn stubble. Soy beans should be planted at about the average time for planting corn. Early or medium early varieties should be used for very late

plantings, but for a seed crop under average Ohio conditions they should not be planted after June 15. For maximum seed yields planting in cultivated rows 24 to 30 in. apart is indicated.

In comparisons made between corn alone, sunflowers alone, and each crop together with soy beans, the average weight per plant of both corn and sunflowers decreased as the stand of plants increased. As the stands of corn and sunflowers increased, there was a very marked decrease in the average size of the soy bean plants. In another test corn alone was compared with corn and soy beans for grain and silage. In the grain series, the presence of the soy beans increased the number of nubbins and decreased the weight of stover, shelled corn, and cobs. The total yield of grain of both corn and soy beans equaled that of corn alone, and the total air-dry matter was slightly in favor of the combination. In the silage series the presence of soy beans decreased the weight of the corn. The slight increase in the percentage of protein in the corn grown with soy beans seemed of doubtful significance. While the total dry matter and protein were greater for the combination than for corn alone, soy beans alone yielded more protein per acre than either. The percentage of protein in Peking soy beans grown alone was higher than when grown in competition with corn.

Time of year to plant mother beets for seed production, D. A. PACK (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 9*, *pp. 811–818*, *pls. 4*).—During 1922 and 1923 similar lots of sugar beets were taken from storage each month, from March to September, inclusive, and planted in rows on the same plat at the Salt Lake City Station (Utah).

The quantity and quality of seed produced seemed to depend on the time of planting, early planted beets producing the most and best seed, and to be directly proportional to the vegetative foliage (except for very late planting), height of seed stalks, and number of seed stalks developed during the second year.

Reproductive development was greatly retarded in the early planted beets. Sugar beets planted in the heat of summer tended to produce seed within a short period, while fall planted beets were very irregular in seed production and did not tend to develop reproductive organs. Light appears to be an important factor in the lengthening of seed stalks when other limiting factors are not present. The beets producing the best and most seed had previously produced the most marked root development. The enlarged root systems were developed when soil and air temperatures were low, and the meager threadlike root systems were developed when these temperatures were high.

These investigations are held to indicate that the second year development of the mother beet should be divided into a period characterized by food mobilization, vegetative foliage development, new root production, and absorption of soil nutrients; and a second period characterized by rapid utilization of mobilized food, development of seed stalks, and production of seed. The optimum temperature for seed stalk and seed development exceeds that for vegetative leaf and root development. The cold air and soil temperatures during the first period inhibit reproductive development and favor complete vegetative development, while the higher temperatures of the second period favor rapid reproductive development and result in the retarding of the vegetative development. There is a maximum reproduction when a plant passes through a first period of complete vegetative development in which the reproductive development is inhibited, followed by a second period of forced reproductive development in which the vegetative development is largely inhibited. The first period is an essential prerequisite to the second. The seed produced

during the second period is directly proportional to the extent of development of the beet during the first period.

The Jeswiet method for the identification of sugar cane varieties, E. M. DE CALVINO (*Internatl. Sugar Jour.*, *27* (*1925*), *No. 313*, *pp. 22–25*).—In a critical discussion the author concludes that the Jeswiet[4] method for the identification of cane varieties, based as it is on the presence of special groups of hairs on the leaf or bud, is neither convenient nor practical since these characters, in quality as well as quantity, depend upon many external conditions.

The relation of some chemical constituents to the grades of Kentucky tobacco, O. M. SHEDD (*Kentucky Sta. Bul. 258* (*1925*), *pp. 33–58*).—A comparative study was made of the total contents of nitrogen, nicotine, nitrate nitrogen, crude ash, silicon, phosphorus, potassium, calcium, and magnesium in the different grades of tobacco represented by 145 samples of Burley and 109 samples of dark tobacco grown in Kentucky in 1920 and 1921. The Burley crop of 1920 was unusually infected with leaf spot diseases, while the dark tobacco of that year was less diseased. Samples of both tobaccos from the 1921 crops were more nearly normal, being freer from disease.

The good division of any grade usually contained a larger percentage of nicotine than the common. The nitrogen and nitrate were more variable, but in general the good carried larger percentages of these constituents than the common. Of the Burley grades, the fillers usually contain the most nitrogen and nicotine and the smokers the least. In dark tobacco the leaf usually has the most nitrogen, nicotine, and nitrate, and the trash the least. The Burley tobacco of 1921 contained more of all constituents determined, except calcium, than that of 1920. The dark tobacco of 1921 also carried more of all, except calcium and phosphorus, than that of 1920. The proportions of phosphorus and magnesium, although different in the two kinds of tobacco, showed the least variation in the same crop in the two years.

The combined Burley samples of both years showed 4.5 per cent more nitrogen and 78.8 per cent more nitrate nitrogen, but 40.9 per cent less nicotine than the dark tobacco. The nitrogenous constituents determined in the dry Burley ranged from 1.96 to 6.05 per cent total nitrogen, 0.29 to 6.18 nicotine, and 0.009 to 1.37 per cent nitrate nitrogen, and for the dark tobacco 2.07 to 5.75 per cent total nitrogen, 2.12 to 7.83 nicotine, and 0.002 to 0.73 per cent nitrate nitrogen.

The proportions of ash constituents, other than phosphorus and magnesium, differed considerably in the good and common grades. The good seemed to have the most potassium. The averages obtained for Burley tobacco apparently show that wrappers have the least silicon and calcium but the most potassium, fillers the least ash and potassium, and smokers the most ash, silicon, and calcium. Dark tobacco averages indicate that the leaf has the least ash and silicon but the most potassium and calcium, while the trash has the most ash and silicon but the least potassium and calcium. The Burley tobacco representing the two years showed 1.7 per cent less ash, 67.7 less silicon, and 36.9 per cent less magnesium, and 81 per cent more phosphorus, 51.7 more potassium, and 37.8 per cent more calcium than the corresponding dark tobacco averages.

Burley leaf badly infected with leaf spot disease contained much less nicotine but more nitrogen than that less diseased, indicating that such tobacco either had part of its nitrogen in detrimental combinations or that the deficiency of nicotine vitiated its quality.

---

[4] Arch. Suikerindus. Nederland. Indië, 24 (1916), No. 12, pp. 359–429.

Wheat growing in New South Wales, H. A. Smith (*Sydney: N. S. Wales Bur. Statis., 1923, pp. 5, pl. 1*).—The characteristics and limits of areas of the State in which wheat can be grown for grain profitably are described with comment on soil, rainfall and evaporation, research, transportation, price and yields, the main factors affecting wheat production in the State.

Canada thistle eradication, F. Detmers (*Ohio Sta. Mo. Bul., 10 (1925), No. 5-6, pp. 87-90*).—The merits of deep cultivation and digging, mowing to prevent seed formation, shallow cultivation, smother crops, and chemical sprays as means of controlling Canadian thistle are set forth. Sprays of both sodium arsenite and calcium arsenite gave promising results in preliminary trials on heavily infested pasture and were preferable to other chemicals.

Quack grass eradication, R. S. Hudson (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 39, 40*).—Sandy land heavily infested with quack grass received different cultural treatments and was limed and seeded to alfalfa. The results obtained indicated that for eradicating quack grass summer fallowing is more reliable on fall plowed than on spring plowed land. Failure to rid a farm of the weed will follow the seeding of a crop before quack grass is entirely dead, nor will fall plowing and seeding to a spring crop, either cultivated or uncultivated, eradicate it. Although special implements are not needed, eradication of quack grass requires frequent and thorough cultivation, no matter which method is used.

HORTICULTURE

The "probable error" in horticultural experiments, K. Sax (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 252-256*).—This contribution from the Maine Experiment Station points out that the usual method of determining the probable error is generally inadequate for horticultural experiments because of the comparatively small populations involved and the frequent assumption that there is no correlation between the trees or plats under comparison. The author cites certain recently published experimental results and shows how the use of Student's method of determining the probable error (E. S. R., 50, p. 827) favors an accurate interpretation of experimental data where relatively few units are concerned. The complete formula for determining the probable error of a difference is considered reliable, but, since essentially the same results can be obtained more easily with Student's method, the latter procedure is recommended for most types of horticultural data.

[Horticultural investigations at the Arizona Station], F. J. Crider, A. F. Kinnison, and D. W. Albert (*Arizona Sta. Rpt. 1922, pp. 221-226, 228, 229*).—In this, the usual annual statement (E. S. R., 48, p. 442), comparative records taken in clean-cultivated and cover-cropped plats of an experimental citrus orchard showed that cultural treatments have considerable effect on soil and air temperatures. For example, the mean atmospheric temperature in the cover-cropped area was 2.5 and 7° F. lower in the winter and summer, respectively, than in the tilled area. At the same time the mean soil temperature in the cover-cropped area was 2.5° higher in winter and 6° lower in summer. The mean atmospheric humidity in the cover-cropped orchard was 11 per cent greater during summer. Evaporation, as determined by the Livingstone atmometer, was 40 per cent less during summer in the cover-cropped section.

Work with dates indicated that two types may be successfully grown in Arizona, namely, early varieties designed for use as fresh fruit and late keeping varieties adapted for processing. Among the early varieties Hayany

was found the best for Arizona conditions. Rapid root production in date offshoots was obtained by mounding the base of the mother tree with moist earth in sufficient quantity to cover the lower portion of the attached shoot. Better survival of detached shoots was obtained by shading with burlap in the open field than by placing the shoots in latticed propagation houses.

Pruning work with 6-year-old olive trees of the Mission and Manzanillo varieties indicated the advisability of a minimum pruning. Comparing three treatments, namely, nothing, short, and long pruning, the yields per tree for the Mission variety were 38, 4.5, and 19 and for the Manzanillo 18, 1, and 6 lbs., respectively. The pruning had no effect on the size of the fruits.

Work with young rooted vinifera grapes indicated the possibility of training to a permanent head the first season. Of the many vinifera varieties tested, the Sultanina and Malaga showed particular commercial value. Girdling studies at the Salt River Valley Farm with the Panarita currant grape showed the advisability of ringing during the blossoming period.

Working with peach trees planted in waterproof cement tanks, it was found that 160.5 and 445.25 gal. of water were used per tree during the first and second seasons, respectively. A mixed 10-year-old orchard of apples, pears, peaches, prunes, and grapes, located at Prescott and maintained exclusively on a dry-farm basis, produced a satisfactory crop of good size and good quality fruit. A survey indicated that there are considerable areas in northern Arizona located at elevations above 5,000 ft. where orchards may be maintained with natural rainfall.

Preliminary observations upon young Royal apricot trees indicated that long pruning is more inducive to early fruiting than is short pruning. Variety tests with pecans, plums, apricots, peaches, nectarines, pears, tomatoes, and garden peas are briefly discussed. Properly cured onions were held in good condition throughout the summer in an adobe sweet-potato storage house and also in slatted bins kept in an open shed. Onion seed was successfully produced at the Yuma Substation.

[Horticultural investigations at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 38, 48, 49, 50, 51, 59–61*).—Similar to the report of the previous year (E. S. R., 51, p. 439), there are presented brief comments on the progress of various investigations.

In reporting upon apple breeding, it is asserted that seed produced from self-pollination and back crossing germinates irregularly and usually results in weak plants lacking in the vigor of cross-pollinated individuals. Tests in cold storage showed five station apples, namely, Ames, Edgewood, Secor, Hawkeye Greening, and Sharon, to possess good keeping qualities. Breeding studies at Charles City indicated that the chance of securing hardy, good quality apples is greater in controlled than in open-pollinated crosses.

Further work on the orchard soil management project showed that apple trees continuously in blue grass are less productive than those continuously in clover sod. Clean cultivation alone and clean cultivation with cover crops exposed the trees to soil washing and winter injury. A correlation was noted between growth and production and the nitrate content of the soil. Analyses of fruit spurs from the different cultural plats showed a high nitrate content to be associated with vigorous growth and high production.

The best results in the germination of apple seeds were obtained with seeds held in a moist condition and at a temperature slightly above freezing during the after-ripening period. Working with the Wealthy apple, it was found that properly ripened and handled fruit could be held in cold storage until late February. Soft scald, found most abundant on immaturely picked fruits,

was practically eliminated by immediate storage. Oiled wrappers practically controlled apple scald and in some cases apparently reduced the amount of soft scald.

Among many apple varieties tested for scion rooting tendencies, the Dudley was found to possess a free rooting habit, as did also some of the station seedlings. Studies conducted in a Wealthy apple orchard at Charles City gave evidence that fruit spurs make their greatest development at the time of blossoming. Since regular bearing is deemed dependent upon the development of spurs of variable lengths, the use of fertilizer, pruning, or a combination of both is desirable for stimulating this essential growth.

Records taken in the State orchard at Council Bluffs showed that nitrate of soda is of high value in sod orchards. Those trees which had been in blue grass for 14 years were brought into a highly productive state as compared with similar nonnitrated trees. Clover was found to be an ideal ground cover for protecting orchards during the rigid winter season.

Tomato seed selection, C. C. STARRING (*Montana Sta. Bul. 173 (1925), pp. 17*).—Records taken on the progeny of individual plant selections from Earliana and Bonny Best stocks obtained from several seed houses in 1920 show, for the four years 1921–1924, differences in the average yields per acre between the highest and the lowest Earliana and Bonny Best of 3,118 and 6,206 lbs., respectively. However, in comparing the average yield of 28 selected strains with the average yield of 6 parental stocks, the difference was slightly in favor of the parents. Comparing the average of the 5 best selections with the average of the 6 parents, the difference was decidedly in favor of the selections.

That one year is not sufficient to establish an improved tomato strain was shown in records taken on Earliana and Bonny Best strains over a period of three years, during which there was conspicuous shifting in rank from year to year. That variations in productiveness may occur within a tomato selection was indicated in records taken on 4 strains arising from a single Earliana plant, the difference between the highest and the lowest average yield of ripe fruit for the years 1918–1921 being 2,926 lbs. per acre. In 6 selections from a single strain, the difference between high and low average yields of ripe marketable fruits for 1919–1921 was 3,723 lbs.

In a comparison of selected Earliana with ordinary commercial stock, the home-grown plants were superior chiefly in yielding a larger proportion of high-grade fruit, leading to the conclusion that the benefit of home selection depends largely upon whether or not there is an opportunity to obtain high-grade commercial seed. Selections for the production of early maturing fruits indicated the possibility of attaining success provided that selection was continued over a sufficient number of years to assure the permanency of early ripening.

In general conclusion, the author points out that, as shown in an earlier publication from the station (E. S. R., 33, p. 438), under conditions prevailing near Bozeman, the yields of ripe tomatoes can be stimulated more by pruning plants to a single stem than by seed selection. However, it is emphasized that seed selection is in itself a wise and profitable practice.

Nursery stock investigations, K. SAX (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 310–312*).—Following an earlier paper (E. S. R., 52, p. 236) on bud and root selection in the propagation of the apple, in which was indicated the importance of taking roots from productive apple trees and of selecting large vigorous French crab seedlings as stocks, the author reports that further measurements upon nursery trees of the McIntosh, Ben Davis, Delicious, and Northern Spy varieties show an increasing effect of seedling root size correlated with increasing age of the trees. It was found that buds which begin growth early

in the spring tend to develop into larger whips than do later starting buds. However, this stimulus was less pronounced in the second year and is considered of little importance in determining the ultimate size of the tree.

Observations in the spring of 1924 upon the development of individual McIntosh buds inserted five to a tree upon 77 seedlings the preceding summer showed as much variation in the development of each group of five buds as there was in five individual buds on separate trees, indicating that differences in the rate of bud development can not be ascribed to seedling compatibilities. Observations upon the development of adjacent buds on parental McIntosh trees showed practically the same variability as on the budded trees, indicating that the technique of budding was not a factor determining the rate of development. The author considers bud individuality to be the factor affecting the rate of development.

Comparing the rate of development of five adjacent buds on 1-year whips, on 10-year-old, and on 30-year-old McIntosh trees, it was found that on May 19 the average development was 3.15 ± 0.02, 2.57 ± 0.03, and 2.17 ± 0.03, respectively. Furthermore, a much higher percentage of branches on the whips showed uniform development, indicating that the younger and more vigorous trees develop their buds more rapidly and uniformly.

Delicious buds inserted upside down on 1-year whips at first developed downwardly and then horizontally, finally assuming the normal growth position, leading the author to suggest that this type of budding may be useful in spreading the tops of certain varieties.

Blooming period and yield of apples: A 15-year average, C. W. Ellenwood (*Ohio Sta. Bul. 385 (1925), pp. 69–82, figs. 2*).—Based on records taken during the period 1910–1924, there are presented miscellaneous data, partly in graphical form, upon the duration and length of the blooming period, the age at initial fruiting, and the average yield per tree of a large number of apple varieties. Averages for the 15 years show that Astrachan was the earliest and Ralls the latest blooming variety. The earliest and the latest were so far apart that the author cautions against interplanting such varieties in the expectation of satisfactory cross-pollination. Based on performance records, the varieties are roughly grouped into four classes, namely, annual, biennial, alternate, and irregular bearers.

When to pick apples: To what extent do factors associated with the ripening of apples indicate the stage of maturity? R. E. Marshall and G. F. Waldo (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 16–20, fig. 1*).—As a contribution to a cooperative study (E. S. R., 51, p. 536) of various factors concerned in determining the maturity of fruit, the authors report upon an investigation conducted at East Lansing with several varieties of apples.

Repeated measurement of attached fruits during the eight weeks preceding harvest showed a steady increase in size up to the time of picking. Storage studies having shown that late-harvested fruits lost neither in keeping nor in eating qualities, it is concluded that the later the harvesting can be safely deferred the better. That rainfall during the ripening period is an important factor in promoting size was shown in larger sized fruits in 1923, a year with late rains, than in 1924, a year with equal total summer but less autumn rainfall. Red coloration was not found to be a reliable index to maturity, being influenced by seasonal and other conditions. The change in ground color from green to yellow proved more reliable. Pressure testers of the Oregon type (E. S. R., 46, p. 641) failed to give satisfactory results. Change in seed color varied so much with varieties as to have no universal application.

In conclusion, the authors state that no single test of maturity was found adequate, but that determinations of maturity must rest with the orchardist and be based on several conditions, such as ground color, ease of separation from the spur, danger of freezing injury, labor conditions, etc.

The basis of grape standardization, F. T. Bioletti (*California Sta. Circ. 293 (1925), pp. 15, figs. 3*).—A comparison of accurate sugar and acid determinations with ordinary eating tests as indicators of maturity in grapes led to the conclusion that the Balling degree test is the simplest and most reliable index to the degree of ripeness of grapes. The variety, locality, and season had an apparent influence in unconsciously modifying the judgment of the tasters. In the Tokay variety, the judgment of the tasters was apparently influenced to some extent by the presence or absence of color. It is believed that a single, invariable sugar standard is impossible of fulfillment, and that standards should be adopted for the standardization law which vary with variety, season, and perhaps with locality or even color.

The utilization of sulfur dioxide in the marketing of grapes, A. J. Winkler and H. E. Jacob (*Hilgardia [California Sta.], 1 (1925), No. 6, pp. 107–131, figs. 4*).—Of several materials, namely, sulfur dioxide, boric acid, formic acid, formaldehyde, benzoate of soda, and salicylic acid, investigated as possible preservatives for fresh grapes, the sulfur dioxide alone appeared promising. When applied in suitable concentrations and in a proper manner, it was found possible to double the life of the fruit with no apparent injury to quality. The sulfur dioxide may be applied as a gas in air, or the grapes may be immersed in a water solution of the gas or in a water solution of potassium or sodium metabisulfite for a definite period. Applications of 50 mg. of sulfur dioxide per kilogram of grapes were sufficient to double the keeping period, and doses up to 100 mg. per kilogram failed to injure the color, texture, or flavor of the fruit. Attempts to treat grapes by burning sulfur inside a glass receptacle were unsuccessful. The rate of absorption of sulfur dioxide by grapes was found to be dependent upon (1) the concentration of the gas, (2) length of exposure, and (3) the temperature, (4) the maturity, and (5) the physical condition of the fruit.

The pineapple industry in Bataan Province, E. K. Morada (*Philippine Agr. Rev., 18 (1925), No. 1, pp. 45–51*).—An article of general interest in regard to the status of pineapple growing in Bataan Province.

Our greatest mountain: A handbook for Mount Rainier National Park, F. W. Schmoe (*New York and London: G. P. Putnam's Sons, 1925, pp. XII+366, pls. 47*).—This is descriptive of the beauty and natural features of Mount Rainier National Park and includes notes on plant and animal life.

FORESTRY

The need for a forest policy, K. A. Carlson (*So. African Jour. Indus., 8 (1925), No. 8, pp. 470–481*).—Briefly outlining the development and present status of forests and forestry in the Union of South Africa, the author discusses the needs of the future, suggesting the desirability of formulating and following a well-defined forest policy.

Forests and soils of Vermilion County, Illinois, with special reference to the "striplands," W. B. McDougall (*Ecology, 6 (1925), No. 4, pp. 372–379, pl. 1*).—A survey of the forests of Vermilion County, essentially a level plain formed by the Wisconsin glaciation, showed six principal forest associations, separated according to soil types and location, namely, (1) the basswood-elm association, occurring on upland brown silt loam, (2) beech-maple-red oak association on upland yellow-gray silt loam, (3) oak-hickory association on

yellow silt loam, (4) mixed hillside association on yellow silt loam, (5) elm-sycamore-maple association on bottomlands, and (6) the cottonwood-willow association along streams. Where, in the process of coal mining, the upper soil layer has been removed, annual weeds were observed to be the first plants to reappear, followed, under favorable conditions, by the bottomland forest association, which frequently became reestablished in approximately 24 years.

The American oaks, W. TRELEASE (*Mem. Nat. Acad. Sci., 20 (1924), pp. V+255, pls. 421, figs. 7*).—A monograph upon the American species of oaks, presenting in detail information concerning their botanical characters, hybrid forms, taxonomy, geographical distribution, geological history, probable evolution, etc.

Note on ainee, Artocarpus hirsuta Lamk., C. C. WILSON (*[Indian] Forest Bul. 60 (1924), pp. 7, pls. 4*).—Herein are presented brief notes on the distribution of the species, reproduction, character, properties, uses of the wood, etc.

Enlarged bases in Fraxinus nigra in Michigan, F. C. GATES and C. O. ERLANSON (*Bot. Gaz., 80 (1925), No. 1, pp. 107–110, figs. 2*).—A brief report upon the discovery of enlarged trunk bases in *F. nigra* growing in permanently water-covered swamps in Cheboygan County. An anatomical study of the stumps showed no increase in the number of vessels in the abnormal wood but a large increase in the number of cells in the summer wood. The individual cells were found to be normal in size and shape.

Some effects of fire on pine hardwood forests in southeastern Ohio, O. A. ALDERMAN (*Ohio Sta. Mo. Bul., 10 (1925), No. 5–6, pp. 93–95*).—Attention is directed to the fact that the common manifestations of fire injury in the forest, namely, scarred trunks, blackened stems, and burnt undergrowth, often obscure from the mind the more serious consequence of the fires, namely, interference with natural plant succession. On poor land seedling pines capable of sturdy development are killed by slight fires, and forced to yield to scrub oaks and other species which, though unable to grow into satisfactory timber, continue to occupy the soil.

DISEASES OF PLANTS

Plant pathology, J. G. BROWN and F. GIBSON (*Arizona Sta. Rpt. 1922, pp. 238–247, figs. 5*).—A report is given of field and laboratory studies made to determine the effect of alkali on the susceptibility of Egyptian-Pima cotton to the black arm disease caused by *Bacterium malvacearum*, and root rot due to *Ozonium omnivorum*. Plantings were made of treated and untreated cotton seed on fairly heavy soil, on light soil which contained alkali in considerable quantity, and in fields that had borne a cotton crop the previous year. Black arm appeared on the plats on heavy soil, and root rot was very destructive, while on the alkali plats no disease appeared, due, it is believed, to a less succulent condition of growth. On the plats where cotton was grown the previous year practically no black arm or angular leaf spot appeared where treated seed was used, but on the control plats many affected plants were observed. For seed treatment sulfuric acid gave the best results. Hot water and 10 per cent formaldehyde destroyed the germinating power of the seed.

Spraying date palms with 5–5–50 Bordeaux mixture is said to have reduced the amount of rot on the fruit and increased the marketable product by about 25 per cent.

Further observations are reported on alfalfa girdle (E. S. R., 51, p. 150). It has been found that the trouble was caused by a hopper, *Stictocephala* sp. In addition to alfalfa a considerable number of native and other plants were found similarly attacked.

Sunburn and aphid injury to soy beans and cowpeas were investigated. All varieties but the Biloxi soy bean were affected to a considerable extent. Following the sunburn and aphid injury a fungus, which has been provisionally identified as *Alternaria atrans*, attacked the foliage.

Spraying experiments in which several varieties of potatoes were planted at different altitudes showed no benefit from two applications of 4–6–50 Bordeaux mixture.

A list is given of plant disease determinations made during the year.

Plant pathology (*Iowa Sta. Rpt. 1924, pp. 34–37*).—In a summary account of investigations carried on in 1923 and 1924, it is stated that 213 strains and varieties of cabbage were tested for yellows. Iowa 5, which was developed at the station, has proved to be quite resistant and is reported by growers to be a very good type of cabbage. This variety was the source of 79 of the strains under test.

Corn smut infection studies were continued, smut being reported as quite prevalent on corn in 1923. The disease seemed to be most abundant during the latter part of the growing season. Laboratory studies of smut are briefly reported upon, in which it is stated that only two smut bolls out of 40 were viable in the spring after they had lain in the field all winter. The spores of corn smut germinated readily in water and various nutrient solutions, the best germination being obtained when the spores rested on a moist substratum rather than in water at 30° C. (86° F.). Slight germination was obtained when the spores rested on a dry substratum in an atmospheric humidity of 100 per cent.

A brief account is given of a new wilt of alfalfa, which is attributed to bacteria. The diseased plants are characterized by wilting, discoloration of the vascular bundles of the roots, and plugging of the water ducts with a yellow or brownish gum in which bacteria are embedded. Inoculation of healthy roots with the organism resulted in discolorations similar to those observed in the field.

A new disease of sumac (*Rhus glabra*), due to a species of Gnomonia, is briefly described.

Considerable additional attention was given during the year to the dry-rot of corn due to *Basisporium gallarum*, noted on page 749.

Crown rust studies of oats have been continued from those previously noted (E. S. R., 47, p. 542), and *Rhamnus dahurica* and *Berchemia scandens* have been found to act as alternate hosts for the rust.

Report of division of plant pathology, F. A. Wolf and S. G. Lehman (*North Carolina Sta. Rpt. 1924, pp. 82–85, fig. 1*).—A summary report is given of investigational work carried on during the year, some of the results of the investigations having been noted elsewhere (E. S. R., 50, p. 348; 52, p. 650) and on page 754.

Among the other investigations the authors report that they were unable to transfer frenching of tobacco either by applying macerated leaf tissues or by grafting diseased buds, which is said to indicate that the disease is not infectious.

Soy-bean mildew, which made its appearance during the year, is said to be identical with a similar disease in the Orient, and it is seed borne. The anthracnose of soy beans previously thought to be caused by *Glomerella cingulata* has been found to be morphologically identical in its conidial stage with *Colletotrichum glycineum*. A root rot due to *Pythium debaryanum* is reported, and the life cycle of *Septoria glycines*, the cause of a brown spot of soy beans, has been worked out.

In investigations on the control of seed-borne infections considerable work was done on cotton anthracnose. Satisfactory methods for treatment with dry heat are said to have been discovered, and a machine for treating seed was devised.

In connection with studies of the take-all of wheat carried on in cooperation with the U. S. Department of Agriculture, oats and rye have been found to be immune, and their planting in rotations is recommended. Extensive tests of varieties of wheat are being conducted to determine their resistance to this disease.

Dewberry anthracnose is said to have been destructive to the crop in the sand-hill section of the State.

Crown gall (*Iowa Sta. Rpt. 1924, pp. 49, 50*).—In continuation of previous work, cooperative investigations have been undertaken in which about 40,000 apple grafts are under observation. The method using Bordeaux mixture previously described (E. S. R., 47, p. 354) is said to have given excellent results.

Fundamentals for taxonomic studies of Fusarium, H. W. WOLLENWEBER, C. D. SHERBAKOFF, O. A. REINKING, H. JOHANN, and A. A. BAILEY (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 9, pp. 833–843, fig. 1*).—The results are given of a conference of a number of students of the genus Fusarium, in which an effort was made to study the various groups and determine the main points relating to the identification of the species.

A key is given to the sections of Fusarium so far as they have been studied.

The production in culture of the ascigerous stage of Fusarium moniliforme, G. O. WINELAND (*Abs. in Phytopathology, 13* (*1923*), *No. 1, p. 51*).—For two years the behavior of a number of single-spore cultures of *F. moniliforme* from corn has been under observation, particularly for the development of an ascigerous stage. Perithecium-like bodies have been produced under certain conditions, but no factorial device developed mature perithecia. Recently, mature perithecia of the Gibberella type were produced by combining two strains of the fungus.

Transmissibility and pathological effects of the mosaic disease, O. H. ELMER (*Iowa Sta. Research Bul. 82* (*1925*), *pp. 39–91, figs. 2*).—Accounts are given of investigations on the transmissibility of mosaic disease through artificial inoculations and insect carriers, and of the pathological effect of mosaic in plants and its relation to environmental conditions.

Evidence is presented which indicates that the mosaic virus is transmissible among species of plants that are widely separated taxonomically, transmission having been obtained among species belonging to 15 families in 11 orders of plants. Successful infection was obtained on tobacco from mosaic plants of sugar cane, corn, bean, raspberry, cucumber, crookneck squash, zinnia, calendula, celery, velvet leaf, milkweed, columbine, spurge, and martynia. The tomato was infected with mosaic virus from sugar cane, bean, crookneck squash, zinnia, calendula, celery, velvet leaf, milkweed, catnip, and martynia. The mosaic virus was transmitted to cowpeas from eggplant, potato, cucumber, and crookneck squash. Petunias became infected with the mosaic virus from cucumber and crookneck squash, the virus from infected celery and spurge plants was transmitted to cucumbers, and *Nicotiana alata* became infected with virus from the bean. Ten new host species of mosaic were found as follows: *Achyrodes aureum*, *Aquilegia coerulea*, *A. canadensis*, *Euphorbia preslii*, *Abutilon theophrasti*, *Nepeta cataria*, *Zinnia elegans*, *Calendula officinalis*, *Heliopsis scabra*, and *Stokesia laevis*.

The mosaic virus transmitted from sugar cane, bean, celery, and other hosts to tobacco and tomato produced mosaic symptoms similar to those occurring on tobacco or tomato infected with the virus from tobacco.

Vigorously growing plants following infection were found to have a shorter mosaic incubation period than slowly growing ones. The masking of mosaic symptoms was not found to be coordinate with attenuation of virulence of the mosaic virus.

The mealy bug (*Pseudococcus maritimus*) and the tobacco hornworm (*Protoparce sexta*) are said to serve as agents for mosaic transmission. Insect carriers of the mosaic virus serve as agents for mosaic transmission among plants belonging to different families and orders.

Quantitative studies are said to have shown that of the four unit pigments of chlorophyll in healthy and mosaic leaves the dark green areas of mosaic tobacco leaves contain more phytochlorin and phytorhodin than healthy leaves, and that the light green areas contain less phytochlorin and phytorhodin than healthy ones. Xanthophyll was present in less and carotin in more abundant amounts in both dark and light green areas of mosaic tobacco leaves.

A bibliography of 64 titles is given.

Progress in barberry eradication, F. E. Kempton (*Abs. in Phytopathology, 13 (1923), No. 1, p. 48*).—In the barberry eradication campaign conducted cooperatively for 5 years by the U. S. Department of Agriculture and 13 North-Central States, experiments begun in September, 1921, with chemical methods, have shown that bushes properly treated with salt or sodium arsenite die completely. Rust spore distribution is being studied by means of airplanes furnished by the War Department Air Service. In the 5 years, 5,806,043 barberry bushes have been found and 5,140,343 removed.

Eradicating the common barberry by means of chemicals, N. F. Thompson (*Abs. in Phytopathology, 13 (1923), No. 1, p. 48*).—In the cooperative barberry eradication campaign conducted by the U. S. Department of Agriculture and 13 North-Central States, it has been found that abundant sprouting may occur after digging out the bushes, also that numerous bushes develop from seeds carried by animals. The killing effectiveness of chemicals is being tested, and certain promising results have been obtained. Of the chemicals studied (more than 40 in number) two have proved satisfactory as to cost, availability, and effectiveness, these being sodium chloride (about 10 lbs. per average bush), applied at any season, and sodium arsenite solution (1 lb. to 5 gal. of water, at 2 gal. of the solution per bush), at least when applied during the growing season.

The influence of soil temperature and moisture on the development of seedling blight of wheat and corn caused by Gibberella saubinetii, J. G. Dickson (*Abs. in Phytopathology, 13 (1923), No. 1, p. 50*).—Greenhouse and field experimentation during three years proves that wheat and corn seedlings become susceptible to wheat scab only when grown under unfavorable temperatures. These are, for wheat, about 12° C. (53.6° F.) and, for corn, below 20°. The response of these plants to soil moisture is the same. In this case, at least, disease resistance and predisposition are largely matters of environment.

The influence of soil temperature and moisture on the chemical composition of wheat and corn and their predisposition to seedling blight, S. H. Eckerson and J. G. Dickson (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 50, 51*).—Controlled temperature and moisture experiments with wheat and corn indicate marked differences in chemical composition of seedlings grown under

different conditions, these differences apparently explaining the variability in their susceptibility to seedling blight (*Gibberella saubinetii*). The compositions of corn seedlings at high and at low temperatures are the reciprocal of those for wheat under the same conditions. In coleoptile and in coleorhiza, the fungus penetrates walls of pectic materials easily, and is both inter- and intracellular, whereas it penetrates cellulose walls slowly, digesting the middle lamella and thus remaining intercellular. All gradations occur at intermediate soil temperatures.

Variations in the length of spores of Helminthosporium sativum under different conditions of growth, L. Dosdall and J. J. Christensen (*Abs. in Phytopathology, 13 (1923), No. 1, p. 50*).—Subcultures from a single spore isolation of *H. sativum*, when measured after being grown at different temperatures, showed spore sizes so variable that only careful comparative study is considered a safe basis for determination.

Aecial stages of the leaf-rust of barley, Puccinia simplex, and of rye, P. dispersa, in the United States, E. B. Mains and H. S. Jackson (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 49, 50*).—Cultures made in 1922 from overwintered telia of barley leaf rust (*P. simplex*) gave heavy infection in greenhouse and field on the weed star of Bethlehem (*Ornithogalum umbellatum*). Cultures in 1919 and 1922 from rye leaf rust gave aecia on *Anchusa officinalis*, other boraginaceous hosts except *Nonea rosea* (which showed a few pycnia only) remaining uninfected. Other races may exist. Aecia occurred naturally on *A. capensis* at La Fayette, Ind.

Basisporium dry rot of corn, L. W. Durrell (*Iowa Sta. Research Bul. 84 (1925), pp. 137–160, figs. 12*).—A report is given of an investigation of a dry-rot of corn that is said to be the same as the cob rot of corn described by Arzberger as caused by *Coniosporium gecevi* (E. S. R., 31, p. 842). This dry-rot is said to have been very prevalent in Iowa in 1923, causing an average damage to the crop of about 9.1 per cent, while in some fields from 50 to 60 per cent of the ears were infected. Heavy precipitation in August and September, when the crop is maturing, is said to favor the development of the disease, studies having shown that the Basisporium is markedly dependent upon excessive moisture conditions when the crop is maturing. The fungus attacks the shanks, husks, and stalks of corn; the shanks particularly being weakened, break off easily. On the ears the fungus is said to be visible at the butt and base of kernels.

In connection with his studies of the spores, the author found that they germinate poorly or not at all in water but readily in tomato or orange juice. When such juices were neutralized to litmus, germination was prevented. Plant tissues in the same atmosphere with the drop cultures also stimulated germination. This led to a study of the action of carbon dioxide, and it was found to stimulate germination.

The temperature relations of the fungus were studied, and sporulation was found to take place between 20 and 35° C. The fungus was found to winter over readily in its conidial stage.

Corn is said to be most susceptible to attack during the time of germination of the seed and in the late stages of maturity. Inoculation of growing roots and stalks yielded negative results. It is said that the fungus does not spread readily in cribbed corn.

A bibliography of the literature of the subject is given.

Pathological morphology of durum wheat grains affected with "black point," W. Weniger (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 48, 49*).—Isolation and other studies have been in progress on a disease, described as occurring in North Dakota, of durum wheat, particularly Pentad (D5), Monad

(D1), Kubanka, and Arnautka. Poor germination is common, and frequently a destructive seedling blight develops. During the previous four years the author isolated a fungus similar to *Helminthosporium sativum* from black pointed grains and blighted seedlings.

The mycelium invades the pericarp and testa, passes between these and the embryo, and may invade the latter. When moisture conditions germination, the mycelium forms lesions in rootlets and plumule before emerging from the grain. Aleurone and endosperm are subsequently attacked. Spores may form in the lesions. In roots and shoots of young seedlings, the fungus attacks the cortex and eventually penetrates the vascular region, causing a rot.

Some fungi causing black point of wheat, A. W. Henry (*Abs. in Phytopathology, 13 (1923), No. 1, p. 49*).—Isolated from black pointed kernels of Marquis wheat grown at St. Paul in 1920 were *Helminthosporium sativum*, *Helminthosporium* sp., *Brachysporium* sp., and *Alternaria* sp. *H. sativum* was isolated also from black pointed kernels from various parts of the United States and Canada. Black pointed immature wheat kernels were also produced by cultures of *H. sativum* isolated from barley, wheat, and rye. Other fungi were also cultured from wheat seed, and black point was caused by *H. sativum*, *Helminthosporium* sp., *Brachysporium* sp., and *Stemphylium* sp. Although plump black pointed kernels frequently germinate well, they have failed in as high percentages as 11 in the greenhouse and 50 in the field to produce plants as compared with controls from normal seeds.

Studies with anthracnose infection in cotton seed, C. A. Ludwig (*South Carolina Sta. Bul. 222 (1925), pp. 52, figs. 14*).—On account of previous conflicting reports relative to the effectiveness of drying on the destruction of the cotton anthracnose organism (*Colletotrichum gossypii*) and the failure of vacuum drying of seed for the control of the disease (E. S. R., 46, p. 741), laboratory experiments were conducted to determine the cause of the mortality of the fungus in the seed and the best conditions for storage of infected seed.

It was found that cotton seed infected with the fungus (*C. gossypii*) becomes free of infection in storage. Under laboratory conditions this action is said to proceed very slowly until the seed become about a year old, when it becomes rapid, and by the second spring after harvest the infection has practically disappeared. No ordinary method of heating or drying the seed preliminary to storage appeared to be of much value in destroying the infection. Delinting with sulfuric acid and sterilizing with corrosive sublimate reduced infection, so that there was a very low initial infection, and that remaining in the seed appeared to become eliminated a few months sooner than in untreated seed. Storing seed in a very moist atmosphere produced the most rapid reduction in anthracnose infection of any means tried, but the seed quickly became musty and failed to germinate. Storage in a very dry atmosphere was found to prolong the life of the fungus whatever the preceding treatment of the seed. Storage in alternating very dry and very moist conditions induced a more rapid diminution of infection at first than where seed was stored under ordinary laboratory conditions. There was little damage from mustiness, but the time of complete freedom from infection was little or no sooner than in untreated seed. Sunning the seed appeared to accelerate the death of the fungus, but the results were so slow that the germination of the seed was seriously impaired before practical results were obtained.

The author concludes that there is no quick means available for the elimination of anthracnose from cotton seed under ordinary farm conditions. The

best results were obtained where the seed was delinted with strong sulfuric acid, placed in clean bags, and stored for two or three years in a dry building.

Miscellaneous experiments with potatoes, B. A. BROWN and W. L. SLATE, JR. (*Connecticut Storrs Sta. Bul. 126 (1925), pp. 27–35, fig. 1*).—A report is given of investigations on the comparative effect of mosaic and leaf roll, of spindle tuber, and of spraying with Bordeaux mixture on the yield of potatoes.

In the comparison of the effect of leaf roll and mosaic on potato yield a strain of potatoes was grown that was derived from tuber units selected for disease resistance in 1921. The strain apparently became infected in 1922, and in 1924 the yield from the leaf roll plants was only 57 per cent that of the mosaic plants, indicating greater severity of the leaf roll disease. Comparing the yields of 1924 with those of 1923, when only a slight infection was observed, a marked reduction in yields was noted.

In the second experiment reported upon, a strain of Irish Cobbler potatoes infected with spindle tuber was planted in 1924, and great reductions in yield were observed, the reduction being correlated with the severity of spindle tuber infection. The data indicate that spindle tuber is a more serious disease of potatoes than leaf roll or mosaic.

Spraying experiments in 1921 and 1922 showed decidedly increased yields for the sprayed plats, while in 1923 there was little difference between plats sprayed four times with Bordeaux mixture and plats receiving only an arsenical. Those sprayed eight times with Bordeaux mixture yielded less than those receiving arsenicals alone.

Investigations on the blackleg disease of potato, J. E. KOTILA and G. H. COONS (*Michigan Sta. Tech. Bul. 67 (1925), pp. 3–29, figs. 7*).—Some results are given of the study of the blackleg disease of potatoes that has been in progress since 1919. This disease in Michigan is said to be caused by *Bacillus atrosepticus*, and it is considered to be a cause of considerable loss in fields. No commercial varieties were found to have sufficient resistance to be of practical value for disease control. The organism was found to attack other plants besides the potato.

Small quantities of inoculum when placed on tuber slices led to oedema formation. It was found that a pectin-dissolving enzyme and a toxic substance were concerned in the production of characteristic symptoms of the disease. The organism was found to overwinter in tubers remaining in the soil, but not directly in the soil. Some evidence was obtained which indicates that the causal organism is unable to penetrate healthy roots. The organism is said to occur in the soil surrounding diseased plants, but it seems to disappear quickly or to lose its pathogenicity.

The rapid decline of *B. atrosepticus* in the soil is thought probably due to many factors, and the authors call attention to the possible rôle which a lytic principle may play in its disappearance. When this lytic principle was placed upon potato tubers normal rotting by *B. atrosepticus* was prevented.

A bibliography of 23 titles is appended.

Sorghum smuts and varietal resistance in sorghums, G. M. REED and L. E. MELCHERS (*U. S. Dept. Agr. Bul. 1284 (1925), pp. 56, pls. 10*).—The authors report that 10 species of smuts have been recorded on sorghum and the related Johnson grass. Seven of these are quite local in their distribution, and only three, *Sphacelotheca sorghi*, *S. cruenta*, and *Sorosporium reilianum*, are known to occur in this country.

The investigations reported upon in this publication were carried on cooperatively between the U. S. Department of Agriculture, the Kansas and Missouri Experiment Stations, and the Brooklyn Botanic Garden, and were

conducted mainly to determine the varietal resistance of sorghums to the covered smut (*Sphacelotheca sorghi*). Observations were also made on the behavior of *Sorosporium reilianum* toward the sorghum varieties. In the course of the experiments varieties of all the different groups of sorghums, including practically all of agronomic importance, were grown.

All the strains of shallu proved very susceptible, while as a group, the sorgos were found to be susceptible and generally had high percentages of infection. Sudan grass was only moderately susceptible. Three varieties of broom corn proved to be moderately susceptible to covered kernel smut, while Shantung, a dwarf brown kaoliang, proved very resistant. All the varieties of kafir tested were susceptible. Two varieties of durra, Brown and White, which have been grown in the United States for several years, proved highly susceptible, while recent introductions of White durra showed a high degree of resistance. The four varieties of milo were resistant to a marked degree. Feterita also proved very resistant. Among the miscellaneous sorghums some proved susceptible, such as the hybrid broom corns and Schrock sorghum. Others showed a somewhat lower percentage of infection, while a high degree of resistance was observed in darso, Dwarf hegari, and Sudan corn.

Observations made at Amarillo, Tex., are said to indicate that the sorghums are less susceptible to *Sorosporium reilianum* than to *Sphacelotheca sorghi*. Feterita, milo, and broom corn showed no infection. The kafirs and kaoliangs were only slightly infected, while Brown durra, White durra, Black Amber sorgo, Minnesota Amber sorgo, Red Amber sorgo, Colman sorgo, Early Rose sorgo, and Schrock sorghum were markedly susceptible.

There appeared to be no correlation between the rate of germination of sorghums and their susceptibility to infection with covered kernel smut. Environmental conditions, however, play an important part in the percentage of infection.

A bibliography of 120 titles is appended.

The influence of temperature on the infection and decay of sweet potatoes by different species of Rhizopus, J. I. Lauritzen and L. L. Harter (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 9*, *pp. 793–810*, *figs. 9*).—In a previous publication Weimer and Harter showed the temperature relations for germination, growth, and spore formation of 11 species of Rhizopus that may cause decay of sweet potatoes (E. S. R., 49, p. 540). In the present paper the authors give an account of experiments made to determine the temperature relations for the infection and decay of sweet potatoes, amount of decay with a rise in temperature, and the time required for infection to take place by 6 species of Rhizopus. Some of the species studied in the previous paper were omitted on account of their almost identical behavior with species here reported, or by reason of their unavailability.

It was found that the time required for Rhizopus to infect sweet potatoes wounded but not artificially inoculated varied from 5 to 7 days at 9° C. to 43 hours and less at from 18 to 32°, the time varying with the amount of wounding and the number of spores present on the potatoes. Of the 6 species of Rhizopus studied, *R. tritici*, *R. oryzae*, and *R. maydis* were found to fall in a high temperature group, with *R. nigricans*, *R. reflexus*, and *R. artocarpi* in a low temperature group. The optima for the high temperature group varied from 32 to 35°, with the maxima about 42° and the minima from 3.4 to 9°. For the low temperature group the optima varied from 18.5 to 24°, with the maxima from 30 to 34.5°, and the minima from 3.4 to 12°. The extreme temperature limits over which the entire group is able to infect sweet potatoes varies between 3.4 and 42°. The only species found to cover this entire temperature range was *R. tritici*.

The increase in the amount of decay was found to be very great with a rise in temperature.

A physiological study of Mucor racemosus and Diplodia tubericola—two sweet potato storage-rot fungi, L. L. Harter (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 961–969*).—A previous investigation of the author and his colleague having shown that species of Rhizopus produce an enzyme, pectinase, that plays an important rôle in the decay of sweet potatoes (E. S. R., 45, p. 749), studies were made of *M. racemosus* and *D. tubericola*, both of which cause a soft rot of sweet potatoes.

Pectinase was not produced by *D. tubericola* when tried on 10 different media, but *M. racemosus* secreted it when growing on decoctions of sweet potato, carrot, turnip, and string bean, but not on prune or potato decoction, or on synthetic media and beef bouillon. Both fungi were found to secrete amylase, invertase, and raffinase but not cytase. The H-ion concentration of decoctions of sweet potato, carrot, potato, turnip, and string bean, and of beef bouillon, was decreased by *M. racemosus*, and that of prune decoction and Czapek's modified nutrient solution was increased. On the other hand, *D. tubericola* decreased the H-ion concentration of all the vegetable decoctions and beef broth, but increased that of synthetic media. The author found that *M. racemosus* was parasitic on sweet potatoes but not on turnips, carrots, or potatoes. The growth of this organism on potatoes did not produce an enzyme which would macerate potato tissue. Although not parasitic on turnips and carrots, an enzyme which would macerate sweet potato disks was produced when grown on decoctions made from these vegetables. When the organism was grown on sweet potato decoction an enzyme capable of macerating turnip and carrot tissue was secreted.

Tobacco resistant to black root-rot in Pennsylvania, C. R. Orton and O. Olson (*Pennsylvania Sta. Bul. 193 (1925), pp. 1–13, figs. 5*).—After describing the root rot of tobacco due to *Thielavia basicola*, an account is given of four years' experiments to determine the relative resistance of varieties and strains of tobacco to this disease. Marked differences were found between the several strains, hybrids, and selections, the hybrids Olson, Hibshman, and Leaman proving superior to the common selections of Pennsylvania Seedleaf. The hybrid variety Hibshman is recognized as the superior type of tobacco for Lancaster County, Pa., while the hybrid Olson is said to be well adapted to the conditions in Clinton County.

Necrosis, hyperplasia, and adhesions in mosaic tomato fruits, M. W. Gardner (*Jour. Agr. Research [U. S.], 30 (1925), No. 9, pp. 871–888, pls. 8, fig. 1*).—In a previous publication the principal characteristics of tomato mosaic were described (E. S. R., 47, p. 449). Subsequent to that publication the disease appeared in a severe type in the greenhouses of the Indiana Experiment Station, offering an opportunity for the study of the abnormalities produced in the fruit. Histological examinations of normal and diseased fruits showed mark differences, a number of which are described.

Illinois blister canker (*Iowa Sta. Rpt. 1924, p. 51*).—It is claimed that the most satisfactory treatment for blister canker is to chisel out the diseased portion, after which the wound is painted with a disinfectant made from white lead, raw linseed oil, and corrosive sublimate.

New aspects of apple blotch control, M. W. Gardner and H. S. Jackson (*Abs. in Phytopathology, 13 (1923), No. 1, p. 44*).—Trunk and limb apple blotch cankers can be cut out effectively from nursery stock with a sharp knife without injury to the underlying cambium. Healing occurs quickly, and no dressing is needed. Nursery sprays are also to be recommended.

Apple scab control in Massachusetts, W. S. KROUT (*Abs. in Phytopathology, 13 (1923), No. 1, p. 44*).—Investigations during two years on *Venturia inaequalis* and control measures thereon are recorded as regards correlation between the incidence and prevalence of scab and the conditions of temperature, relative humidity, and rainfall. Under almost perfect scab infection conditions nearly complete control was secured as regards scab with McIntosh apples. The best results were obtained with a 3–10–50 homemade Bordeaux mixture for the pink application, followed by liquid or dry lime sulfur for succeeding sprays. The results indicate that dry lime sulfur is as effective as the liquid form against scab. In 1922 dusts were practically as effective as sprays. Sulfur dusts and copper lime dusts were tested, the former being more satisfactory, as it did not russet the fruit or burn the foliage.

Oak fungus in orchard trees, A. H. HENDRICKSON (*California Sta. Circ. 289 (1925), pp. 13, figs. 7*).—A popular account is given of the oak fungus (*Armillaria mellea*), which is said to attack many deciduous fruit trees and ornamentals. All rootstocks for stone fruits commonly used in California are said to be more or less susceptible to the fungus. Apples were found to be usually highly resistant, especially if grown on Delicious stock, and the French pear root seemed to be practically immune. The fig and California black walnut are also highly resistant.

For the control of this trouble, it is recommended that if infected areas are limited in extent the progress of the fungus may be checked by inclosing the diseased spots with a concrete barrier. If the diseased area is extensive, it is recommended that it should be replanted with some of the resistant species. In replanting with either pears on French root or with walnuts on black walnut root, care should be taken to see that the graft union is not covered with soil, as the susceptible scion may be attacked while the roots are not affected.

Strawberry leaf scorch, F. A. WOLF (*Jour. Elisha Mitchell Sci. Soc., 39 (1924), No. 3–4, pp. 141–163, pls. 7*).—Strawberry leaf scorch, appearing in Europe nearly 100 years previously and known in the United States for nearly 40 years, has become very destructive in North Carolina and has been under investigation since the summer of 1921. It caused much loss in 1922 but less in 1923. The disease is described, with discussion of the associated fungus, which is considered to be a member of the genus Diplocarpon, formerly held in the family Microthyriaceae, but now placed in the discomycetous order Phacidieae. The strawberry leaf scorch fungus is herein technically described as to genus and species and is given the name *D. earliana*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report of the entomologist of the Arizona Station], C. T. VORHIES (*Arizona Sta. Rpt. 1922, pp. 219, 220*).—Work with range rodents is briefly referred to, a report of studies of the kangaroo rat *Dipodomys spectabilis*, in cooperation with the U. S. D. A. Bureau of Biological Survey, having been previously noted (E. S. R., 48, p. 249). Life history studies of two species of jack rabbit of southern Arizona, *Lepus alleni* and *L. californicus*, showed a rate of reproduction less than anticipated.

It is reported that the cercopid *Clastoptera obtusa* Say, which commonly occurs on the native wild grape (*Vitis arizonica*) in the mountains, has become a pest of cultivated grapes in the State where grown nearby.

[Report of zoological work at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 42–46*).—It is pointed out that the daily flaxseed count is the only constant and reliable factor to use in predicting the safe seeding date in Iowa, due to

the extremely fluctuating emergence of the fall brood of Hessian flies. In this work 100 flaxseeds were collected daily at each station from old stubble dug at random in heavily infested fields. In the 1923 campaign against this pest, in which 52 counties cooperated, 80 per cent of the farmers in 30 counties drilled their wheat on or after the fly-free date, and in neither 1922 nor 1923 was wheat drilled on or after the fly-free date damaged by the fall brood of flies.

Brief reference is made to studies of the apple leaf trumpet miner by E. W. Dunnam, previously noted (E. S. R., 52, p. 357). The stalk borer has increased rapidly and caused considerable damage to oats, wheat, timothy, corn, and many garden and flowering plants, a 20-acre field of corn near Marshalltown having been destroyed by it. Reports of varying degrees of injury by it are said to have been received from about 40 counties. Other insects mentioned include the melon aphid, striped cucumber beetle, onion maggot, and the seedcorn maggot. In trapping moles, the best results were obtained from the use of the Nash Loop or choker trap. A comparison is being made to determine the race of bees best adapted to the State. In a study of Iowa snakes in their relation to agriculture, all but about four small varieties have been collected and their habits studied.

[Economic insects in New Jersey] (*N. J. State Hort. Soc. Proc., 1924, pp. 85–99, 120–123*).—Papers relating to economic entomology presented at the annual meeting of the State Horticultural Society held at Atlantic City in November, 1924, are as follows: Life History and Habits of the Oriental Peach Moth, by A. Peterson (pp. 85–87), and Field Control Work of 1924 [with the Oriental Peach Moth], by L. A. Stearns (pp. 87–92), which two papers relate to investigations previously noted from another source (E. S. R., 53, p. 53); Points in the Life History and Habits of the Oriental Peach Moth and Recommendations for Control, by T. J. Headlee (pp. 92–94), a circular relating to which, by the author, has been noted (E. S. R., 51, p. 161); The Present Status of the Japanese Beetle (pp. 95–99) and Nicotine Dusts for Vegetable Insects: Wireworm Control (pp. 120–123) (E. S. R., 52, p. 849), both by T. J. Headlee.

Report of division of entomology, [North Carolina Station], F. Sherman (*North Carolina Sta. Rpt. 1924, pp. 67–80, figs. 2*).—A brief account is given of the status of entomological work being conducted, including data on potato spraying and flea-beetle control, the black corn weevil, cutworm damage from *Feltia gladiaria*, *Peridroma saucia*, and *F. annexa*, the boll weevil, plum curculio on peaches, fall canker worm in mountain forests, parasites of the Hessian fly, the Mexican bean beetle, codling moth, and San Jose scale control.

Economic insects in Norway in 1922 and 1923 [trans. title], T. H. Schøyen (*[Norway] Landbr. Dir. Beret., Tillegg C, Beret. Skadeinsekt. og Plantesykd., 1923, pp. 1–40, figs. 27*).—An account of the more important economic insects of 1922 and 1923.

Bean insects, N. F. Howard (*Canner, 60 (1925), No. 11, II, pp. 100, 101*).—A brief account of bean insects, particularly the Mexican bean beetle.

The insect enemies of the pecan in North Carolina, R. W. Leiby (*N. C. Dept. Agr. Bul., 1925, Feb., pp. 3–67, figs. 64*).—A practical summary of information on the important insect enemies of the pecan and means for their control.

A multiple temperature incubator, C. B. Williams and T. W. Kirkpatrick (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 38 (1924), pp. 4, pls. 9*).—The author describes an incubator perfected for use in temperature work with cotton insects.

Efficiency of "stickers" in increasing insecticidal value of Bordeaux mixtures (*Iowa Sta. Rpt. 1924, pp. 39, 40*).—Analyses made to determine the

copper percentage on leaves sprayed with Bordeaux mixture for the control of the potato leafhopper indicates (1) that in general the self-prepared Bordeaux mixture, 4-4-50 formula, adheres better to the foliage than do proprietary preparations of the mixture, (2) that this higher percentage of adherence is slight under conditions in which there is considerable rainfall, (3) that during dry periods self-prepared Bordeaux adheres much better than the proprietary compounds, and (4) that small amounts of either linseed oil or a casein preparation increase the sticking power of all Bordeaux mixtures, including the homemade as well as proprietary preparations.

Breeding and development of the Columbian ground squirrel, W. T. Shaw (*Jour. Mammal., 6 (1925), No. 2, pp. 106–113, pls. 4*).—An account of extended studies conducted at the Washington College Experiment Station, in connection with those previously noted (E. S. R., 53, p. 251).

Tracking the Columbian ground-squirrel to its burrow, W. T. Shaw (*Natl. Geogr. Mag., 47 (1925), No. 5, pp. 587–596, figs. 13*).—This is a popular account of the investigations of *Citellus columbianus*, noted above.

The seasonal differences of north and south slopes in controlling the activities of the Columbian ground squirrel, W. T. Shaw (*Ecology, 6 (1925), No. 2, pp. 157–162, figs. 2*).—This is a report of observations in connection with the investigations noted above. It appears that the animals of the northeast slope emerge from hibernation about 10 days later than those of the southwest slope. They breed later by a corresponding amount of time, develop the young accordingly, and return to aestivation in keeping with their other retarded activities.

Birds in their relations to man, C. M. Weed and N. Dearborn (*Philadelphia and London: J. B. Lippincott Co., 1924, 3. ed., rev., pp. VIII+414, pls. 19, figs. 142*).—This is a third, revised edition of the work previously noted (E. S. R., 36, p. 152).

Bird islands of Peru: The record of a sojourn on the west coast, R. C. Murphy (*New York and London: G. P. Putnam's Sons, 1925, pp. XX+362, pls. 32, figs. 10*).—This account is based upon observations while upon an expedition which was in the field from September, 1919, until February, 1920.

The grasshoppers of British Columbia, R. C. Treherne and E. R. Buckell (*Canada Dept. Agr. Bul. 39, n. ser. (1924), pp. 47, pls. 3, figs. 18*).—Following a brief introduction, a description of a typical range area, the history of grasshopper outbreaks, causes of range depletion, and lists of range vegetation, a discussion is given of the species of grasshoppers of economic importance in British Columbia. They include the clear-winged grasshopper, *Xanthippus neglectus* (Thos.), *Trimerotropis monticola* Saus., *Platybothrus brunneus* (Thos.), *Melanoplus infantilis* Scudd., the lesser migratory grasshopper, *Spharagemon aequale* (Say), *Metator nevadensis* (Brun.), *M. bruneri* (Scudd.), *Bradynotes obilcotinae* Heb., *Amphitornus nanus* R. & H., *Aeorchoreutes carlinianus carlinianus* (Thos.), *Anabrus longipes* Caud., the coulee cricket, and *Steiroxys trilineata* (Thos.). This is followed by an account of natural control, including parasites, and of artificial control measures.

The control of the European apple sucker, Psyllia mali Schmidb., in Nova Scotia, particularly by the fungous disease Entomophthora sphaerosperma Fres., A. G. Dustan (*Canada Dept. Agr. Pamphlet 45, n. ser. (1924), pp. 13, figs. 8*).—This is an account of control work with *P. mali*, officially known as the apple psylla, which now occurs in seven counties of Nova Scotia. An earlier account by the author has been noted (E. S. R., 48, p. 750), as has work by Brittain (E. S. R., 53, p. 53).

Biology and control of Comstock's mealy bug on the umbrella catalpa, W. S. Hough (*Virginia Sta. Tech. Bul. 29 (1925), pp. 27, figs. 13*).—This sum-

ed account of ***Pseudococcus comstocki*** Kuw., based upon investigations y at Winchester, includes much data on its life history presented in ır and diagrammatic form. This mealybug has been a serious enemy : umbrella catalpa in northern Virginia during the past three years. It .es a sticky fluid on the leaves, in which a sooty mold grows, and the are also injured through the loss of sap and the formation of galls, . weaken the smaller limbs.

ıter is passed in the egg stage in white cottonlike masses deposited during er, November, and December beneath the old leaves on the tree and in :acks and crevices of the bark. There are three generations, the first · appearing on the leaves in late April or early May about 10 days after ıtalpa buds open. Eggs of the second generation are deposited over a l of about 30 days, commencing from the middle of June to the first part ly. The average incubation is 10.57 to 11 days. From 50 to 57 days was ·ed for completion of the life cycle. Most of the injury to the trees is by the third generation in late August and September, oviposition for generation may commence as early as August 5.

trol measures include the pruning of all main branches back to 18 in. the leaves drop, cleaning from the tree and burning of all old leaves ıoroughly cleaning out cracks, crevices, and bark with a wire brush, and ›plication during the dormant season of lime sulfur or an oil spray.

ıtrolling the citrus aphid, J. R. WATSON (*Fla. Grower, 31 (1925), No. 20, 7, fig. 1*).—This account is based upon work previously noted (E. S. R., 755).

ontribution to the knowledge of Schizoneura lanigera Hausm. and rasite Aphelinus mali italica Del Guercio, G. DEL GUERCIO (*Nuova Contione allo Studio della Schizoneora del Melo e del suo Nemico Endofago inus mali Hald. var. italica Del Guercio. Florence: Ist. Agr. Colon. Ital., pp. 35, pls. 3, figs. 2*).—This is a summary of information on the woolly aphid and its control in Italy.

te palm scale control work in Arizona] (*Arizona Sta. Rpt. 1922, pp. 81*).—A brief account is given of control work begun in January, 1922. stated that, as a result of regular monthly inspection and follow-up ıent, the Parlatoria scale had largely disappeared from the Tempe date :d, and the palms were recovering rapidly from the effects of defolia- nd torching and during the past year had made a satisfactory growth ›re a light crop of fruit.

· efficiency of birds in destroying overwintering larvae of the Euro- corn borer in New England, G. W. BARBER (*Psyche, 32 (1925), No. 1, pp. pl. 1, figs. 2*).—The finding of numerous empty burrows of the European ›orer in cornstalks in the spring, during the course of investigations by . S. D. A. Bureau of Entomology in eastern New England, led to the s here reported, the details of which are presented in tabular form. › distinct types of work by birds were observed, (1) that of wood- 's, particularly the downy woodpecker, which drills holes into standing in order to reach the overwintering larvae, and (2) that of grackles, ırds, starlings, and other species which shred stalks that have fallen ınd devour the hiding larvae. Experiments conducted for the purpose ermining whether or not the habit of feeding on larvae of this insect was ıl resulted in the discovery in 1923 that birds had fed extensively on contained in the cornstalks from 5 of 18 localities from which corn- had been recovered in good condition, the proportion of larvae credited

to such feeding ranging from 12 to 84 per cent and averaging 61 per cent for these 5 localities.

"Examinations in the spring of 1924 showed that of 47 localities, the cornstalks of which were recovered in good condition, birds had fed extensively on the larvae contained in the cornstalks of 16 localities, the extent of such feeding ranging from 19 to 78.5 per cent. The average proportion of larvae taken from these 16 localities was 54 per cent, and the average of larvae taken from the whole number of 47 localities was 19 per cent. The feeding, which was mostly the work of woodpeckers, was found to be over a much more extended area in the spring of 1924 than in the spring of 1923."

The importance of the feeding by birds on overwintering larvae at the present time, taking the infested area in New England as a whole, is not great. It is pointed out that the important point at present lies in the birds finding the overwintering larvae and feeding upon them, and that such feeding seems to be on the increase.

Notes on warble flies in North Wales, C. L. Walton (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 195–199*).—Notes are presented on the distribution of the ordinary cattle grub and the northern cattle grub in North Wales from 1920 to 1924, together with the results of some control work. The experiments show that the application of iodoform and vaseline ointment, as recommended by F. C. Bishopp[5] destroys practically all warbles.

The ox warble in Switzerland: Its economic importance and control [trans. title], A. Gansser (*Ann. Agr. Suisse, 25 (1924), No. 2, pp. 193–236, pl. 1, figs. 23*).—This is a summary of information on the biology and control of the ox warble, including much data in tabular form, which was presented as an address at a conference of the Society of Natural Sciences at Basel, in May, 1922.

The fleas of the genus Xenopsylla in relation to plague, L. F. Hirst (*Spolia Zeylanica, 12 (1923), No. 46, pp. 318–322*).—The author reports that attempts to transmit plague between rats, mice, and guinea pigs with accurately identified *X. astia* Roth. have failed, 75 individuals having been used in the experiments. In a similar series of experiments in which only 23 *X. cheopis* were used, the plague was transmitted from mouse to mouse four times during January and February, 1922. The distribution of these two species on rats in their relation to plague within the city of Colombo, Ceylon, was investigated during 1921 and 1922, the results being summarized. The earlier conclusion that *X. astia* does not bite man readily was confirmed.

The ham beetle, Necrobia rufipes De Geer, P. Simmons and G. W. Ellington (*Jour. Agr. Research [U. S.], 30 (1925), No. 9, pp. 845–863, pls. 2, fig. 1*).—This is a report of studies of the red-legged ham beetle, details relating to the biology of which are presented, largely in tabular form. The beetle is widely distributed over the warmer parts of the world, frequently being found as an inhabitant of stores of bones and other inedible animal products. On the islands of the Pacific it is a pest of copra, and in parts of the United States sporadic injury, occasionally of considerable extent, is done to long-stored hams, shoulders, and bacon. The larvae are responsible for most of the damage to infested meats, in which they bore holes, preferably burrowing into the fat parts.

Pupation occurs within a white cocoon constructed with drops of froth emitted from the mouth of the larva. The adult may live more than 14 months, the female depositing as many as 2,100 eggs during that time. In warm weather the incubation period is 4 days or more, the preoviposition

[5] Jour. Econ. Ent., 15 (1922), No. 4, pp. 264, 265.

period being as brief as 2 days. The period from the hatching of the egg to adult emergence may be as short as 30 days, including 17 days as growing larva and 13 days within the cocoon. The careful wrapping of meats is said to be an important consideration in the prevention of injury. A thorough fumigation with hydrocyanic acid gas is thought to be probably the most effective method for the eradication of an infestation.

A list is given of 34 references to the literature cited.

Bionomic data on the coffee berry borer (Stephanoderes hampei) [trans. title], K. Friederichs (*Meded. Koffiebessenboeboek Fonds* [*Java*], *No. 11* (*1924*), *pp. 261–286*).—This is a report of studies of the life history and habits of *S. hampei* as related to its control.

Variation in resistance of varieties of coffee to the coffee berry borer [trans. title], K. Friederichs (*Meded. Koffiebessenboeboek Fonds* [*Java*], *No. 11* (*1924*), *pp. 315–358*).—This is a report of studies conducted in connection with the investigations above noted.

Differences in susceptibility of coffee to attack by the coffee berry borer [trans. title], J. Schweizer (*Meded. Koffiebessenboeboek Fonds* [*Java*], *No. 11* (*1924*), *pp. 287–314, figs. 4*).—It is concluded that further investigations are necessary in order to determine the different degrees of susceptibility of coffee varieties to *Stephanoderes hampei*.

Progress report on studies on boll weevil control under South Carolina conditions, G. M. Armstrong, R. W. Moreland, and R. C. Gaines (*South Carolina Sta. Bul. 223* (*1925*), *pp. 64, figs. 25*).—This is a report of cooperative work conducted by the station and the U. S. Department of Agriculture. The details of the investigations are presented in considerable part in chart and tabular form.

"Calcium arsenate dust applied after 10 per cent of the squares were found to be punctured by the weevils made 2.6 times the increase of seed cotton that was made with the Florida method, 3.1 times that with one presquare application of molasses mixture, 4.9 times that with two presquare applications of molasses mixture, 1.6 times that with molasses mixture applied with both mop and sprayer, 2.2 times that with molasses mixture applied with a mop throughout the season, and 2.6 times that with Hill's mixture. Early applications of molasses mixture and early applications of calcium arsenate dust, both of which were followed by calcium arsenate dust after 10 per cent infestation, made practically the same increase of seed cotton as calcium arsenate dust applied after 10 per cent infestation. One presquare application of molasses mixture followed by calcium arsenate dust after 10 per cent infestation made 2.8 times the increase of seed cotton that was made with one presquare application of molasses mixture alone. One presquare application of calcium arsenate dust followed by calcium arsenate dust after 10 per cent infestation made 2.2 times the gain of seed cotton that was made with one presquare application of calcium arsenate dust alone. Molasses mixture applied with both mop and sprayer and nicotine dust made practically the same increase of seed cotton. Molasses mixture applied with both mop and sprayer made 2.6 times the increase of seed cotton that was made with Dr. Bruce's Vitamine poison."

A monograph of the pachyrrhynchid group of the Brachyderinae, Curculionidae, I–III, W. Schultze (*Philippine Jour. Sci.*, *23* (*1923*), *No. 6, pp. 609–673, pls. 6; 24* (*1924*), *No. 3, pp. 309–366, pls. 3; 25* (*1924*), *No. 3, pp. 359–390, pls. 2; 26* (*1925*), *No. 2, pp. 131–309, pls. 12*).—Following an introduction, part 1 of this monograph includes brief notes on the biology of the Pachyrrhynchides, mimetic relations, and general distribution and part of the systematic classification and bibliographic notes, with a key to the genera and descrip-

tions of the forms of the genus Pachyrrhynchus (12 of which are described as new); part 2 contains descriptions of the forms of the genera Eupachyrrhynchus, Macrocyrtus (1 of which is described as new), Eumacrocyrtus, Apocyrtus (1 of which is described as new), Proapocyrtus, Pseudapocyrtus, Nothapocyrtus, and Exnothapocyrtus; and part 3 contains descriptions of the forms of the genera Apocyrtidius and Metapocyrtus (101 of which are described as new).

Notes on the hibernation of Ichneumonidae and on some parasites of Tortrix viridana L., G. L. R. Hancock (*Ent. Mo. Mag., 3. ser., 11 (1925), Nos. 121, pp. 23, 24; 122, pp. 25–28*).—This records observations of ichneumonids found hibernating in Cambridgeshire and in foliage in various parts of England, and includes records of some experiments on the effect of cold on these parasites and notes on some parasites and hyperparasites of the oak Tortrix, *T. viridana* L.

On the biology of Dibrachys affinis Masi, a parasite of the Eudemis moth [trans. title], P. Voukassovitch (*Rev. Zool. Agr. et Appl., 23 (1924), Nos. 4, pp. 92–98; 5, pp. 119–131*).—This is a report of studies of a chalcidid parasite first reared from pupae of the Eudemis vine moth and cocoons of *Anilastus ebeninus* and *Apanteles glomeratus* by Silvestri at Portici, Italy, in 1912. It was observed to parasitize the Eudemis moth in vineyards of Monlon during the winters of 1921–22 and 1922–23 and also at Toulouse, France.

The identification of the organism of Rocky Mountain spotted fever in the blood, C. L. Connor (*Jour. Infect. Diseases, 35 (1924), No. 6, pp. 587–590, figs. 2*).—The author finds that the causative organism of this tick-transmitted disease may be detected in the blood and cell-free serum of infected guinea pigs by dilution and prolonged centrifugation. Staining for more than four hours in Giemsa's stain and differentiation in 95 per cent alcohol seem necessary to bring it out properly. The organism may be found by recovering infected blood from the peritoneum of a normal guinea pig two days after intraperitoneal inoculation.

The egg-producing capacity of Ascaris lumbricoides, E. B. Cram (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 977–983, figs. 6*).—This is a report of an approximate count made of the number of eggs in two adult specimens of *A. lumbricoides*. In the first specimen the eggs in 13 cross sections and 13 longitudinal sections of 5 portions of ovary and 12 cross and 12 longitudinal sections of 4 portions of uterus were counted. The same procedure was followed in the second specimen, except that 18 cross and longitudinal sections of 6 portions of ovary and 9 cross and longitudinal sections of 3 portions of uterus were counted. Multiplying the numbers obtained by the total length of the ovaries and uteri gave 23,668,372 as the total number of eggs in the ovaries and 2,821,425 in the uteri, or a total of 26,489,797 eggs in the first specimen. In the second specimen the number of eggs in the ovaries was estimated as 25,144,591, in the uteri as 2,413,224, and the total number as 27,557,815.

Parasitic nematodes from Tonkin, Indo-China, including a new species of Ascaridia, B. Schwartz (*U. S. Natl. Mus. Proc., 66 (1925), Art. 1, pp. 9, fig. 1*).—Under the name *A. anseris*, the author describes a new species occurring in the goose (*Anser domesticus*) in Hanoi, Tonkin. A species of Setaria, probably *S. digitata* v. L., was taken from the eye of a horse.

On the species of Gongylonema (Nematoda) parasitic in ruminants, H. A. Baylis (*Jour. Compar. Path. and Ther., 38 (1925), No. 1, pp. 46–55, figs. 5*).—The author presents the results of studies of *G. pulchrum* Molin and *G. verrucosum* Giles.

A case of Theileria mutans infection (Egyptian fever) in Palestine, S. J. Gilbert (*Jour. Compar. Path. and Ther., 37 (1924), No. 3, pp. 158–160, figs. 2*).—The author reports upon the occurrence of *T. mutans* in a 2½-year-old

bull born soon after the importation of its mother into Palestine from the Netherlands. It is stated that the ticks thus far identified from the area are the cattle tick and *Hyaloma egyptium*.

A monograph on the Tetraphyllidea, with notes on related cestodes, T. SOUTHWELL (*Liverpool School Trop. Med. Mem., n. ser., No. 2 (1925), pp. XV+368*).—This is a monograph of an order of cestodes which are largely parasites of fish. The foreword is by A. E. Shipley.

FOODS—HUMAN NUTRITION

Microorganisms in decomposing oysters, A. C. HUNTER and B. A. LINDEN (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 971–976*).—Supplementing a previous study on the spoilage of oysters,[6] an attempt was made to identify the bacteria present in the shucked oysters at varying stages of decomposition. This paper summarizes the results of this study by a classification of the bacteria isolated in three groups: (1) The types which, on inoculation into artificially purified oysters or into oyster infusion medium, produced foul and putrefactive odors, (2) those which produced acidity or sourness in the oyster media, and (3) the remaining organisms which appeared to have no effect in pure culture.

The bacteria comprising the first group included members of the genera Serratia (water and soil bacteria producing red pigment), Pseudomonas (water and soil bacteria producing a blue-green pigment), Proteus, Clostridium (spore-forming obligate anaerobes), and Bacillus (spore-forming aerobes). In the second group *Aerobacter aerogenes* and *A. cloacae* were found throughout the culture period of spoilage, *Escherichia coli* and *E. communior* during the early stages, and streptococci, lactobacilli, and yeasts during the late stages when the H-ion concentration was between pH 5 and 4.6. The organisms of the third group included ordinary nonspore-forming soil and water bacteria and yeasts. Some were present throughout the whole period of the experiment, others in the early stages only, and the yeasts in the late stages.

It was found that washing the shucked oysters in fresh water or in brine had no apparent effect on the character of the bacterial flora.

The influence of different substances on the diastatic activity of saliva, H. WALKER (*Biochem. Jour., 19 (1925), No. 2, pp. 221–225, figs. 16*).—In this study the activity of saliva excreted after various substances had been placed in the mouth and rolled between the tongue and palate was compared with that of saliva previously secured in the empty mouth.

Of the substances examined, sucrose and saccharin had the most marked effect in producing an active saliva. Maltose appeared to increase the quantity but decrease the activity of the ptyalin, while lactose produced the opposite effect. Glucose and fructose both lowered the activity of the saliva.

The effect of halogen salts on salivary digestion, W. M. CLIFFORD (*Biochem. Jour., 19 (1925), No. 2, pp. 218–220*).—The effect of various halogen salts on the rate of salivary digestion of starch was tested by determining the time required for the appearance of the achromic point, which is defined as the point at which a drop of digestion mixture and iodine and a drop of distilled water and iodine placed side by side on a white tile are identical in color.

The determination indicated that the chlorine ion has a definitely accelerating action on the rate of salivary digestion, that the bromine ion is inert, and that the metallic ion is of relative unimportance. With fluorides and iodides

[6] Amer. Food Jour., 18 (1923), No. 11, pp. 538–540.

marked differences were obtained which did not appear to be due to the metallic ion, the H-ion concentration of the solution, or to the salt as a whole.

The relation between sulphur and nitrogen metabolism, H. E. C. Wilson (*Biochem. Jour., 19 (1925), No. 2, pp. 322–337*).—The metabolism studies reported were undertaken to determine whether the breakdown of ingested protein is immediate or is spread over several days, whether there is any difference in the rates of excretion of nitrogen and sulfur, whether the ingested protein can cover the breakdown of body protein in the first few days of starvation, and what is the nature of the stored material.

Four groups of experiments were carried out on the author, a healthy subject weighing 60 kg. (132 lbs.). In the first series a nitrogen-free diet of olive oil, tapioca, and sugar was taken until the nitrogen excretion for 24 hours was below 3 gm. The protein to be investigated was then superimposed for 1 day, followed by fasting for 2 days, and then a return to the basal diet until the nitrogen output had fallen to the original value. Gelatin and egg white were used as the protein in two successive experiments. The second and third groups consisted of two experiments each in which gelatin and egg white were superimposed on a basal diet containing 6 and 11 gm. of nitrogen, respectively. The fourth was the same as the first with the omission of the starvation period. Data are tabulated on the excretion of total nitrogen, ammonia nitrogen, uric acid, total phosphorus, and the ratios S : N and P_2O_5 : N. From his analysis of these data, the author draws the following conclusions:

"There is a delay in the excretion of ingested protein extending over several days. This occurs whether the basal diet contains nitrogen or not and even when the feeding is followed by a short period of starvation. The sulfur moiety of the protein molecule is the first to be mobilized both in the storage and breakdown of protein. There is always a delay in the excretion of nitrogen as compared with sulfur. The delay in the excretion of sulfur, which is sometimes found, is not due to a delay in the utilization of the sulfur moiety of the protein. It is due to an active preferential retention of sulfur in the tissues. There is a certain amount of evidence that the retained material can exercise a sparing action on protein breakdown in the first few days of starvation. Ingested protein may be retained in the body in some relatively complex form."

The influence of muscle work on protein metabolism, E. P. Cathcart (*Physiol. Rev., 5 (1925), No. 2, pp. 225–243, figs. 2*).—In this review evidence from the literature is summarized which, in the opinion of the author, indicates that "muscle work leads to a definite though perhaps limited increase in the output of nitrogen, i. e., to increased catabolism of protein, and at the same time there is also good evidence that the same muscle activity leads to the laying down of protein, i. e., to the stimulation of the anabolic processes in the broadest sense of the term. In other words, the existent evidence points to a definitely enhanced metabolism of protein as the result of muscle activity."

A bibliography of 77 titles is appended.

Studies on the metabolism of arginine and histidine.—Part I, Arginine and histidine as precursors of purines, C. P. Stewart (*Biochem. Jour., 19 (1925), No. 2, pp. 266–269*).—To test the hypothesis, advanced by Ackroyd and Hopkins (E. S. R., 37, p. 265) and later questioned by other workers, that arginine and histidine are utilized in the animal body as precursors of the purines, the method of liver perfusion was used with excised cats' livers. Instead of running controls on separate livers, each liver was perfused for a

definite time with a known volume of Ringer's solution alone and then with the solution in question, using the difference in amounts of the substance estimated as representing the change taking place. Using allantoin production as evidence of the purine formation, it was found that no increase in the production of allantoin beyond the limits of experimental error resulted from the perfusion of arginine or histidine through the excised liver.

The utilization of fat in the animal body, W. R. BLOOR (*Jour. Metabolic Research, 4 (1923), No. 5–6, pp. 549–574*).—A lecture delivered before the Harvey Society, New York, November 3, 1923.

Observations on blood phosphates as related to carbohydrate metabolism, A. BOLLIGER and F. W. HARTMAN (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 91–109, figs. 18*).—The relationship of phosphates to carbohydrate metabolism was studied, for the most part in dogs varying from normal to completely depancreatized. Glucose was injected intravenously, and determinations were made of the phosphorus and sugar content of the blood at stated intervals. A second series of experiments was conducted in which the effect of insulin on sugar and phosphorus was determined. A few determinations were also made of the sugar and phosphorus content of the blood of diabetic patients following injections of glucose and of the effect of pituitrin and adrenaline. The observations are thought to establish the following points:

"The diabetic state is demonstrated early in the curve of blood phosphates; blood phosphates are depressed during carbohydrate metabolism only when insulin is available; the complete absence of pancreatic hormone is shown by the blood phosphate level which remains unaffected as a straight line during carbohydrate metabolism; as concerns phosphate metabolism, pituitrin is a direct antagonist of insulin; and carbohydrates and phosphates are best utilized when there is an excess of each in the circulation."

Ultra-violet radiations in conditions of extreme calcium and phosphorus deficiency, H. S. MITCHELL and F. JOHNSON (*Amer. Jour. Physiol., 72 (1925), No. 1, pp. 143–150, figs. 4*).—In this investigation three groups of young rats were used. Group A was kept on a normal diet, group B on a rickets-producing diet extremely low in both calcium and phosphorus, and group C on the same rickets-producing diet with systematic ultra-violet radiation at a distance of 36 in., beginning with 2 minutes three times each week and gradually increasing to 50 or 60 minutes. Daily observations were made of growth and general condition, with frequent X-ray examinations. After 170 days the rats were all killed and used either for histological studies or for determinations of total calcium. The general results by groups were as follows:

In growth and general condition group A was normal, group B stunted and deformed, and group C nearly normal. X-ray studies made early and at the end of the experiment showed normal bone development in group A, definite rachitic changes in group B, and healing in group C. The histological studies also showed the healing effect of the ultra-violet radiation in group C. The examinations on autopsy showed a definite rachitic condition in group B and improvement in group C. The percentages of total calcium in the three groups were 3.009, 2.01, and 2.5 per cent, respectively.

These results are thought to demonstrate that "ultra-violet light not only aids in healing of rickets caused by deficiency of either phosphorus or calcium, as shown by other workers, but causes a retention of calcium when both factors are deficient and a consequent beneficial effect on the skeletal development and the organism as a whole."

The effect of ultra-violet irradiation on the state of the serum calcium, A. R. MORITZ (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 81–89, fig. 1*).—In this

study a new method of separating diffusible from nondiffusible calcium in t blood was used. This consists essentially in placing the serum in a collodi sac immersed in distilled water and subjected to a negative pressure of 1 mm. of mercury. The ultrafilter used in the separation is described and illu trated. The method requires only 2 cc. of serum, and the separation is sa to be complete within 5 hours, with an error of about 4 per cent. Using th method, determinations were made of the diffusible calcium of the blood seru of normal rabbits before ultra-violet irradiation in vitro or in vivo. N changes could be noted in either the total calcium or diffusible calcium fo lowing the irradiation.

Basal metabolism, J. T. KING, JR. (*Baltimore: Williams & Wilkins Co., 192 pp. 118, pl. 1, figs. 15*).—A concise treatment of basal metabolism, with partic lar reference to the determination of the metabolic rate in the practice medicine. An extensive bibliography is appended.

The kata-thermometer in studies of body heat and efficiency (*[Gt. Bri Med. Research Council Spec. Rpt. Ser. No. 73 (1923), pp. 196, figs. 55*).—Th volume comprises the reports of special studies conducted by various inves gators on the use of the kata thermometer. The subjects and authors are follows: The Kata-thermometer as a Physical Instrument, by D. Hargoo Ash; Comparison of Kata-thermometer Readings in Temperate, Alpine, a Subtropical Climates, by L. Hill; The Use of the Kata-thermometer in Indu try, by H. M. Vernon; A Kata-thermometric Comparison of Methods of Hea ing and Ventilating, by T. Bedford and T. C. Angus; The Effect of Increasi or Lessening the Humidity of the Air in a Room, by L. Hill; Ventilation Tes on Board a Large Atlantic Liner, by T. C. Angus; The Index of Comfort High Atmospheric Temperatures, by H. M. Vernon; Observations on Meta olism during Rest and Work, with Special Reference to Atmospheric Cooli Power, by L. Hill and J. A. Campbell; A New Recording Kata-thermomete by E. H. J. Schuster; Alterations in a Laundry to Improve the Atmospher Conditions, by M. Smith; and The Effect of Moisture upon the Cooling Pow of Air as Measured by the Dry Bulb Kata-thermometer, by T. C. Angus.

Concerning the influence of tropical climate on man, C. EIJKMAN (*Lanc [London], 1924, I, No. 18, pp. 887–893*).—This interesting discussion is base upon the author's long experience in the Dutch East Indies where, at th medical laboratory of Weltevreden, opportunity was afforded for the investig tion of many problems connected with the effect of tropical climate upo European subjects. The topics considered include so-called tropical anemi metabolism and heat production, heat regulation, acclimatization, and coloniz tion.

The knowledge of vitamins.—IV, The content of vitamins A and B i horseflesh [trans. title], A. SCHEUNERT and C. HERMERSDÖRFER (*Biochen Ztschr., 156 (1925), No. 1–4, pp. 58–62, figs. 2*).—Continuing the series pr viously noted (E. S. R., 53, p. 566), a few growth curves of rats are reporte which, in the opinion of the authors, indicate that cooked horse meat (fa free) is lacking in vitamin B, but that it furnishes sufficient vitamin A fo the growth of young rats when fed in 2-gm. amounts daily.

Vitamins in canned foods.—III, Canned spinach, W. H. EDDY, E. F. KO MAN, and V. CARLSSON (*Indus. and Engin. Chem., 17 (1925), No. 1, pp. 69–7 figs. 4*).—The investigation of the effect of canning processes upon vitamin (E. S. R., 53, p. 566) has been extended to spinach, and in addition studie have been made of the effect of the same processes on the content of vitamin A and B. Dried spinach was prepared by heating the fresh (or canned spinach in open trays in a hot-air oven at a temperature not exceeding 60° C

until dry enough to crumble readily. Home-cooked spinach was prepared by placing rinsed spinach in a covered kettle, heating it to boiling, and boiling for 15 minutes. The canned spinach was prepared by blanching in hot water or steam for from 1 to 5 minutes, sealing in brine-filled 2½ cans, and processing for 70 or 120 minutes at 115°.

In the experiments reported for vitamin C, two brands of skim-milk powder were used in the basal diet. The second of these proved more resistant to destruction of vitamin C than the first. On the first basal diet 1 gm. of raw spinach daily furnished sufficient vitamin C for complete protection during the 90 days of the experiment. On the second (not entirely free from C) 0.25 gm. was sufficient. In comparison with this, home-cooked spinach in an amount equivalent to 5 gm. of the raw spinach was insufficient to protect against scurvy. On 10 gm. 2 of the 3 guinea pigs showed no symptoms of scurvy and gained in weight. With the same basal diet canned spinach equivalent to 1 gm. of raw spinach furnished as much protection as home-cooked spinach equivalent to 10 gm. of raw spinach except in the 5-minute blanch. *With this twice as much was required. These results are thought to* confirm the view advanced in the first two papers of the series that the oxidation factor is more important than the heat factor in the destruction of vitamin C, and that "in the canning process as evolved commercially the antiscorbutic factor in foods is preserved to the extent of making such canned foods important sources of this vitamin."

In the vitamin A experiments, the amount of raw spinach selected was 26 mg. daily, an amount shown by unpublished work of Sherman and Munsell to be the minimum for the growth of rats. With this amount and its equivalent in home-cooked and canned products comparable growth curves were obtained, showing that neither canning nor home cooking affected the vitamin A content of the spinach.

The vitamin B experiments included pigeon tests conducted by R. R. Williams and rat tests. The former showed that dried raw spinach in amounts equivalent to 4.4 gm. of raw spinach was without appreciable protective effect for pigeons on polished rice. In the rat experiments the amount required for normal growth was found to vary between 0.5 and 2 gm. expressed in terms of raw spinach. The rats would not eat enough of the canned spinach to furnish consistent results.

Studies on the chemistry of cod liver oil.—I, The effect of hydrogenation upon the vitamine content. II, A cod liver oil concentrate manifesting both antirachitic and antiophthalmic properties, H. E. DUBIN and C. FUNK (*Jour. Metabolic Research, 4 (1923), No, 5–6, pp. 461–479, pls. 9*).—This is the detailed report of an investigation noted from a preliminary report (E. S. R., 52, p. 263).

The oxidation of vitamin A in butterfat [trans. title], J. B. PLATON (*Biochem. Ztschr., 155 (1925), No. 3–4, pp. 228–234, figs. 2*).—The comparison is reported of the vitamin A content of sweet butterfat prepared in the usual way and in an atmosphere of carbon dioxide to prevent oxidation. No difference could be detected sufficient to denote any destruction of the vitamin A during the ordinary process of manufacture.

Synthesis of vitamin A by a fresh-water alga, Chlorella (sp.?), K. H. COWARD (*Biochem. Jour., 19 (1925), No. 2, pp. 240, 241, fig. 1*).—Previous experiments on the synthesis of vitamin A by a marine diatom (E. S. R., 47, p. 769) were repeated with a culture of Chlorella known to be free from bacteria. Definite evidence was obtained of the synthesis of vitamin A by this alga.

Microbes and vitamins [trans. title], P. GOY (*Ann. Inst. Pasteur, 39 (1925), No. 2, pp. 183–195*).—This paper is largely a summary of previously reported

studies on the growth-promoting substance present in Mucor (E. S. R., 45, p. 465). Further work has shown that the growth of various pathogenic organisms is greatly stimulated by the presence of the filtrate from a culture of Amylomucor.

Feeding experiments on rats with plants at different stages of development.—Part II, *B. Harrow and F. Krasnow (Jour. Metabolic Research, 4 (1923), No. 5–6, pp. 491–497, figs. 2).*—Previously noted from another source (E. S. R., 51, p. 767).

Technique in the use of the rat for vitamin B studies, E. V. McCollum, N. Simmonds, and J. E. Becker *(Jour. Biol. Chem., 63 (1925), No. 3, pp. 547–551).*—This paper, which is an attempt to justify the authors' technique in using shavings as bedding in vitamin studies conducted on rats, was occasioned by the paper of Steenbock, Sell, and Nelson (E. S. R., 49, p. 665), in which it was stated that vitamin B studies under such conditions are of little value on account of the consumption of vitamin B in the feces. The refutation of this criticism is based on observations indicating that rats on vitamin-deficient diets soon cease to eat their feces, and that the feces themselves soon become lacking in vitamins.

A comparison of dried and evaporated milks by a dietetic method, G. A. Hartwell *(Biochem. Jour., 19 (1925), No. 2, pp. 226–232, figs. 2).*—The method adopted in this comparison of dried and evaporated milk as a source of vitamin B for rats was to use the milk as a supplement to a basal diet on which the mother rats remained in good condition but the young developed spasms and died. It had previously been found (E. S. R., 47, p. 858) that the addition of 100 cc. of whole milk to the basal diet prevented this trouble.

In the present study the same basal diet was used. To this was added in the various feeding trials 75, 50, 33, 24, 18, and 12 cc. of fresh milk, with sufficient water to make a paste, 12, 10.5, and 9 gm. of dried milk in 100 cc. of water, and evaporated milk in the dilution given on the can and in the same amounts as the cow's milk. The dried milks included 5 of the roller process and 3 of the spray process, and 4 samples of evaporated milk were used. Controls were fed bread and milk in the proportion of 15 gm. of bread to 50 cc. of milk.

On the fresh milk growth was nearly normal with 75 and 50 cc. of milk. Below this the condition of the young became increasingly worse. The dried milks varied in their vitamin B content, some being slightly more and some slightly less efficient than fresh milk. This variation did not appear to be correlated with the method of manufacture, but to depend somewhat upon the content of cream. The evaporated milks gave poorer results than either dried or fresh milk.

The nature of avitaminosis from investigations on the wasting form of this disease [trans. title], A. Bickel *(Biochem. Ztschr., 146 (1924), No. 5–6, pp. 493–521).*—This is a review and discussion of investigations on metabolism in avitaminosis conducted in the author's laboratory (E. S. R., 50, p. 863).

Contribution to the biochemistry of avitaminoses.—V, Investigations on the metabolism of rabbits on vitamin-free rations [trans. title], A. Palladin and A. Kudrjawzewa *(Biochem. Ztschr., 154 (1924), No. 1–2, pp. 104–124).*—Metabolism studies similar to those reported in previous papers of the series (E. S. R., 53, p. 164) were conducted on rabbits to determine the rôle of vitamins in the control of metabolic processes in this species.

The data obtained are thought to indicate that vitamins A and C play no important part in the metabolism of rabbits, but that absence of vitamin B causes marked metabolic disturbances ending fatally. The principal changes brought about are thought to be a lowering of the diastatic properties of the

blood resulting in a disturbance in the carbohydrate metabolism. On a ration of rice this took the form of hypoglycemia, followed by hyperglycemia, and finally by a second period of hypoglycemia. On autoclaved oats the final period of hypoglycemia did not occur. The nitrogen metabolism is also disturbed by absence of vitamin B. This is manifested by an increased output of urea, uric acid, and ammonia, and an increased creatine content of the muscles which brings about an increase in the creatinine coefficient and creatinuria. In rabbits on a rice diet, the content of neutral fat and cholesterol in the blood is lowered and the alcohol fraction raised. The mineral metabolism of rabbits is apparently undisturbed by a lack of vitamins.

The relation of vitamin deficiency to muscle fatigue, V. E. Nelson, F. M. Baldwin, A. G. Riggs, and M. Cunningham (*Amer. Jour. Physiol., 72 (1925), No. 1, pp. 69–75, fig. 1*).—Typical fatigue curves are reproduced of the gastrocnemius muscles of a normal rat and of rats which had been kept on a vitamin B-deficient diet for 3, 6, 8, and 10 weeks and on a vitamin A-deficient diet for 3 and 6 weeks. The curves of both the A- and B-deficient animals showed progressive diminution in amplitude and endurance with increasing time on the deficient diet. In the case of the deficiency in B there was also a progressive loss of tonicity which was not so evident in the A-deficient.

***Further studies on the cause of ophthalmia in rats produced with diets* containing vitamin A,** E. V. McCollum, N. Simmonds, and J. E. Becker (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 161–179, figs. 5*).—Further studies on the cause of ophthalmia previously noted as occurring in rats on diets furnishing adequate amounts of vitamin A but excessive amounts of salts (E. S. R., 48, p. 464) are reported, with the conclusion that the ophthalmia can not be induced by feeding excessive amounts of any one element or ion, but that a determining factor may be the total amount of a salt mixture and its composition with reference to the other constituents of the diet. Yeast when serving as the sole source of vitamin B was less effective in protecting rats against the effects of excessive salt feeding than equivalent amounts of wheat germ. As a possible explanation of the results reported, the suggestion is advanced that vitamin B contains two or more substances.

A study of clinical rickets.—Comparison of results obtained on exposure to sunlight and on treatment with cod liver oil or an active concentrate prepared from cod liver oil, L. Fischer (*Jour. Metabolic Research, 4 (1923), No. 5–6, pp. 481–489, pls. 2*).—Previously noted from a preliminary report (E. S. R., 52, p. 263).

The antirachitic value of irradiated cholesterol and phytosterol, II, III, A. F. Hess and M. Weinstock (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 181–201, figs. 8*).—In continuation of previous studies (E. S. R., 53, p. 568), two papers are presented.

II. *Further evidence of change in biological activity.*—Other substances which can be rendered antirachitic by irradiation with a quartz vapor lamp are reported as follows: Spinach thus activated was effective for rats in doses of 10 gm. per capita of the cooked material. It does not lose this property on subsequent boiling for ½ hour. Cholesterol in 1 per cent suspension activated by an exposure for somewhat over 2 minutes at a distance of 1 ft. was effective in doses of 0.25 cc. daily. Irradiated cholesterol was also effective when injected subcutaneously in doses of 0.1 and 0.25 cc. of the aqueous suspension. The activated cholesterol had protective properties against low calcium as well as low phosphorus rickets. Human and calf skin, when fed in amounts of 1 gm. daily to rats on a low phosphorus diet, was protective against rickets when irradiated but not without irradiation. A series of tests with selective filters showed that the radiations capable of activating cholesterol are similar in

their wave lengths to those which protect the animals against rickets when directly exposed to the rays.

The saturated reduction products of cholesterol and phytosterol (dihydrocholesterol and dihydrophytosterol), and the unsaturated terpenes, cymene, and citronella oil, could not be rendered antirachitic by irradiation.

III. *Evidence of chemical change as shown by absorption spectra.*—"By means of spectral absorption tests a chemical change was demonstrated in cholesterol which had been endowed with antirachitic potency by ultra-violet irradiation. This activated cholesterol absorbs ultra-violet radiations to a less degree than does ordinary cholesterol, an effect which is intensified with increasing degrees of irradiation. If, however, irradiation is prolonged for many hours the activated cholesterol becomes less transparent than even nonirradiated cholesterol. This comparatively opaque product is of a yellowish color and has a lowered melting point. Visible light, radiant heat, and Roentgen rays do not alter the absorption spectrum of cholesterol. Neither dihydrocholesterol nor dihydrophytosterol undergoes a spectral change as the result of irradiation. When activated cholesterol is kept in a watery suspension or in a dry state its spectral transmission becomes gradually diminished until it reaches a point where it transmits less than it did originally. These spectrographic results were tested and confirmed quantitatively by means of a thermopile-galvanometer set."

The antiscorbutic properties of eggs, S. M. Hauge and C. W. Carrick (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 111, 112*).—Egg white when fed to guinea pigs in amounts of 20 cc. daily and egg yolk in amounts of 15 cc. daily were without antiscorbutic effect in preventive and curative tests.

Thrice-cooked vegetables for diabetics, H. A. Stillman (*Jour. Metabolic Research, 4 (1923), No. 5-6, pp. 575–577, figs. 2*).—Supplementing a previous study of the vitamin content of spinach prepared in various ways (E. S. R., 52, p. 262), the author presents a few growth curves showing that 4 gm. of thrice-cooked spinach daily is entirely insufficient as a source of vitamins for growing rats.

ANIMAL PRODUCTION

Animal nutrition work [at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 38, 39*).—In studying the action of daily doses of 0.5 oz. of sulfur on pregnant ewes, no effect on the animals or their offspring from such feeding was observed. A considerable portion of the sulfur was found to be retained in the body, though there was evidence that some had been oxidized to sulfates and excreted in the urine. Less oxidation occurred in swine than in ewes. Potassium citrate tended to have a more unfavorable effect on the sodium balance of ewes than potassium carbonate or potassium chloride as fed in previous experiments, though the unfavorable effects were not shown in the lambs.

Unfavorable results occurred when potassium citrate was fed to rats and rabbits during the growing period. Rats grew poorly and died at an early age, while the rabbits made fair growth but did not reproduce. No favorable or unfavorable effect resulted in rats from the feeding of less than 0.5 per cent of sulfur in a ration of yellow corn, tankage, oil meal, bone meal, and salt. The addition of 0.25 per cent of sodium fluoride resulted in a cessation of growth and death after from 10 to 12 weeks of feeding. The rats grew and reproduced satisfactorily on rations containing 0.1 per cent of sodium fluoride, but the young did not grow normally. Normal growth of young, however, occurred when 0.05 per cent was included in the ration. It is pointed

out that rock phosphate contains considerable fluorine, which may cause unfavorable results from the feeding of this material.

In iodine feeding experiments, no lambs occurred with goiter when the ewes received potassium iodide, though some occurred in the control lot.

On the production of body size in animals and the relation of size to energy requirements [trans. title], M. RUBNER (*Sitzber. Preuss. Akad. Wiss., No. 14–17 (1924), pp. 217–234, fig. 1*).—A discussion of the rates and limitations of growth and the control of temperature in warm and cold blooded animals with reference to their influence on the energy required for growth.

Analyses of Arizona feeding stuffs, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1922, pp. 196, 197*).—The chemical composition of Arizona feeding stuffs analyzed during the year is tabulated.

[Feeding experiments with beef cattle at the Arizona Station], R. H. WILLIAMS and E. B. STANLEY (*Arizona Sta. Rpt. 1922, pp. 208–210*).—The results of the following feeding and fattening experiments are briefly reported:

Age and quality as factors in cattle feeding.—In making a comparison of the rate and economy of gains made by cattle of different ages during a 98-day test on hegari stover silage and alfalfa hay with small amounts of cracked hegari and cottonseed meal, 4 lots of cattle representing calves, yearling steers, 2-year-old steers, and old cows were selected.

The average weights at the beginning of the test of the four types of cattle were per head 272, 504, 653, and 829 lbs., respectively. The average daily gains per head and the feed required reduced to a dry matter basis per 100 lbs. of gain were, respectively, as follows: Calves 2.04 and 530 lbs., yearlings 2.36 and 668 lbs., 2-year-olds 2.73 and 722 lbs., and old cows 2.11 and 1,087 lbs. The calculated costs per pound of gain were in the order of advancing age. Two additional lots of inferior yearlings and 2-year-old steers were also similarly fed, and it was found that the inferior cattle made practically as large gains as the better grade animals of the same age, but did not finish into such desirable carcasses.

Small calves v. large calves v. yearling steers for feeding.—In feeding tests over a period of 95 days at the Prescott Dry Farm, it was found that yearling steers made larger gains than calves but at greater costs, and that the older and larger animals were made ready for market in less time. Calves averaging 270 and 329 lbs. per head consumed nearly equal amounts of feed and made approximately the same gains. Yearlings required 31.28 per cent more feed than calves to make the same gains.

Feeding steer calves v. old cows on sunflower silage and cottonseed meal.—In a test at the Cochise Dry Farm, steer calves averaging 432 lbs. in live weight per head made average daily gains of 1.74 lbs. on a ration of 42.87 lbs. of sunflower silage and 1.99 lbs. of cottonseed meal daily. Old range cows averaging 775 lbs. in live weight made average daily gains of 1.91 lbs. and consumed an average of 62.25 lbs. of sunflower silage and 2.27 lbs. of cottonseed meal daily. It was calculated that the average return per head was $14.08 greater for the calves.

Alfalfa hay as a supplement to dry farm silage and cottonseed meal in fattening calves.—Two lots of 8 calves each averaging 329 lbs. per head were used for studying the value of additions of alfalfa hay to a ration of silage and cottonseed meal during a 95-day test. The addition of 1.42 lbs. of alfalfa hay per head daily to the basal ration resulted in gains that were ⅛ lb. greater per day. It was calculated that 3.88 per cent less feed was required to produce gains by the lot receiving the alfalfa hay.

Supplements to cottonseed meal in fattening old range cows.—Four lots of old range cows were selected for comparing various dry-farm feeds for fattening such animals when fed with 3 lbs. of cottonseed meal per head daily. The rations consisted of sunflower silage full fed, sorgo silage full fed, sorgo fodder full fed, and the freedom of a pasture containing large amounts of dry grass. The experiment began December 28, 1921, and ended April 3, 1922. The results showed that sorgo silage produced more rapid gains and a better finish than sunflower silage, but that sorgo fodder did not produce large gains. Dry range grass was distinctly inferior to the other rations and indicated that old range cows can not be fattened on 3 lbs. of cottonseed meal, with winter range.

Cattle feeding experiments (*Iowa Sta. Rpt. 1924, pp. 22–24*).—In continuing the cattle feeding experiments (E. S. R., 51, p. 468), 10 lots of 2-year-old steers were fed for 120 days, beginning December 18, 1923. The results indicated that additions of 1 oz. daily per head of a mineral mixture of equal parts of ground limestone and spent bone black plus 0.02 per cent of potassium iodide benefited a ration of shelled corn, mixed and clover hay, and salt. Linseed oil meal proved to be a better supplement than ground soy beans or soy bean oil meal in that it promoted greater gains, did not cause scouring, and produced a better finish. Soy bean hay proved inferior to clover hay, and oats did not prove to be an efficient substitute for part of the corn or protein supplement. A study of the variation between two similarly fed lots showed that their average daily gains differed by 0.04 lb., the calculated cost per 100 lbs. of gain differed by 30 cts., and the calculated profits per head over feed cost by 21 cts.

[Experiments with cattle at the North Carolina Station] (*North Carolina Sta. Rpt. 1924, pp. 48, 56–58, 60*).—The studies of the effect of rations of cottonseed meal on cattle have been continued (E. S. R., 51, p. 876), and in addition a study of the effect of rations solely from the corn plant has been started.

Cottonseed meal feeding investigations.—Rations of corn silage and cottonseed meal with and without cracked corn were found by V. M. Williams to be unsatisfactory for reproduction in dairy cows, but when minerals, other proteins, and accessory food substances were added to this ration, practically normal reproduction and lactation resulted. Calves suckling the cows receiving the supplements were also able to make normal growth. In experiments with beef cattle, conducted by R. S. Curtis and D. W. Jones, supplements of calcium carbonate, butterfat, cod liver oil, yeast, steam bone meal, and wheat embryo were found to have a corrective effect on the cottonseed meal ration.

Corn plant feeding investigations, V. M. Williams.—Four cows wintered on a ration of corn grain and corn fodder developed an unthrifty appearance, and calves were frequently born prematurely, blind, and weak. Calves usually grew normally and good milk production resulted when corn silage, steam bone meal, and certain vitamin-carrying feeds were added to the ration.

Feeding experiments with grade beef cows raising calves, E. W. Sheets and R. H. Tuckwiller (*West Virginia Sta. Bul. 190 (1925), pp. 20, figs. 8*).—Comparative values of different rations for wintering beef cows raising calves with the calculated costs of each ration and other related information are reported as obtained in 4 years' experiments conducted cooperatively by the station and the U. S. Department of Agriculture.

Three lots of 10 beef cows each were fed each year. The winter rations of the different lots consisted of lot 1, corn silage, mixed hay, and wheat straw; lot 2, corn silage, soy bean hay, and wheat straw; and lot 3, corn silage, cottonseed meal, and wheat straw. The ration including soy bean hay was replaced

in a fourth lot by one of shock corn, mixed hay, and wheat straw during the first year. Sufficient feed was furnished to keep the cows in good condition. All lots were pastured during the summer. The results showed that with the mixed hay ration the cows required an average of 3,052 lbs. of silage, 1,036 lbs. of mixed hay, and 348 lbs. of wheat straw for wintering. With the soy bean hay ration 3,256 lbs. of corn silage, 1,000 lbs. of soy bean hay, and 301 lbs. of wheat straw were required. With the cottonseed meal ration 3,204 lbs. of corn silage, 198 lbs. of cottonseed meal, and 949 lbs. of wheat straw were necessary for wintering a cow. The 1 year's results without silage showed that the cows consumed per head 1,830 lbs. of shock corn, 1,220 lbs. of mixed hay, and 224 lbs. of wheat straw.

The cows lost an average of 4 lbs. in live weight on the ration including mixed hay and produced 9.7 calves averaging 65.8 lbs. at birth. On the ration including soy bean hay the cows made average gains per head of 47 lbs. and produced 9.5 calves averaging 67.6 lbs. at birth. The cows receiving cottonseed meal in the ration made average gains of 20 lbs. and produced 9.3 calves averaging 65.4 lbs. at birth. The dry ration, including shock corn fed during the 1 year, resulted in an average loss of 49 lbs. per head. Ten calves were produced on this ration averaging 61.1 lbs at birth.

Winter feeding beef calves, C. N. Arnett, R. C. McChord, and J. O. Tretsven (*Montana Sta. Bul. 176 (1925), pp. 29*).—The results of five years' experiments dealing with the different methods of feeding beef calves during the winter, with the subsequent effect on the summer pasture gains in some of the experiments, are reported. The calves used were of good breeding, being from high grade beef cows mated with Hereford bulls.

Comparison of medium and heavy grain rations for winter feeding beef calves: Experiment No. I.—Two lots of 7 and 8 calves were used for this test. One lot was full-fed for 185 days on a grain mixture of oats, barley, soft wheat, and bran, 3:3:3:1, averaging 6.7 lbs. per head daily. In addition 8 lbs. of timothy hay were also given. The grain ration of the other lot was limited to 2.9 lbs. per head daily, while the hay consumption averaged 12.1 lbs. The feeding period for this lot was 172 days. The average daily gains made were 1.5 lbs. per head by the former lot and 1.03 lbs. by the latter. The full-fed calves were fairly fat, but it is stated that an additional 30 days' feeding would have increased their selling price. The calves fed the limited grain ration were not fat enough for killing, but were fatter than was necessary for pasture purposes.

Comparison of hay with medium and with heavy grain rations for winter feeding beef calves: Experiment No. II.—Twenty-six calves were divided into 3 lots for checking the results of the preceding experiment and for comparison with a ration of hay alone for wintering calves. The rations of the two lots receiving grain were similar to those in the above experiment except that the feeds consisted of rolled oats and barley, equal parts, with alsike clover and timothy hay. The third lot consumed 13.7 lbs of hay per head daily. The feeding period lasted 136 days. The average daily gains made by the different lots were hay only 1.08 lbs. per head, limited grain 1.56, and heavy grain ration 1.96 lbs. The calves receiving the heavy grain ration were fat at the conclusion of the experiment. Those receiving the hay ration were well grown and in good condition for summer pasturing, while the limited-fed calves were intermediate.

Comparison of hay with medium and with heavy grain rations for winter feeding beef calves: Experiment No. III.—This experiment was a repetition of the preceding except that the feeds consisted of rolled oats and cottonseed meal,

4:1, and mixed clover and timothy hay. The average daily gains per head made by the no grain, medium grain, and heavy grain-fed lots during the 129 days of the experiment were 0.94, 1.55, and 1.78 lbs., respectively. The calves wintered on hay only were in good condition for summer pasture. The calves receiving the medium grain ration were fatter than necessary for turning on pasture but not fat enough for killing purposes. The calves receiving the heavy grain ration produced fair carcasses, but were not sufficiently finished to grade as prime.

The combined results of the three experiments noted and others in which five lots of calves were wintered on hay alone, four on hay and a limited grain ration, and three on hay and a heavy grain ration showed that calves wintered on hay alone made good growth and were in excellent condition to turn on pasture. The calves receiving the limited grain ration were a little too fat for pasturing and not fat enough for killing purposes. The heavy grain feeding for 150 days produced fat animals, but their quality would have been improved had they been fed for 50 days longer.

Sunflower silage as a substitute for a portion of the roughage in a standard grain and hay ration for beef calves: Experiment No. IV.—Three lots of 11 calves each were selected for this 150-day experiment. All lots received an average daily ration per head of 3.07 lbs. of a grain mixture of oats, barley, and mill feed, 18:7:5, with a mixture of timothy and alsike clover hay and a full feed of sunflower silage in two lots. The hay ration of the lots receiving silage was limited to two-thirds and one-third, respectively, of the amount of hay consumed by the lot receiving no silage. The average daily gains made by the different lots were for the lot receiving grain and hay 1.32 lbs. per head, for the lot receiving the medium feed of hay 1.13 lbs., and for the lot receiving the small feed of hay 1.1 lbs. There was little difference in the condition of the calves at the conclusion of the test.

Alfalfa hay v. alfalfa hay and sunflower silage for winter feeding beef calves without grain: Experiment No. V.—Two lots of calves were fed for 158 days, the one lot on alfalfa hay only and the other on one-half the amount of alfalfa hay consumed by the first lot plus sunflower silage. The average daily gains per head made by the lots were, respectively, 0.93 and 0.74 lb. There was little choice between the two lots for turning on grass pasture, though those receiving hay only were a little fatter. During 106 days on a pasture of mixed grasses following the winter feeding period, the lot previously receiving hay only made average daily gains of 1.5 lbs. as compared with 1.6 lbs. by the lot receiving hay and sunflower silage. The total gains per head during the winter and summer were 25 lbs. greater for the lot wintered on alfalfa hay only.

Alfalfa hay v. alfalfa hay and sunflower silage for winter feeding beef calves without grain: Experiment No. VI.—Two lots of 10 calves each were wintered for 144 days on rations similar to those in the above experiment except that the hay given with the sunflower silage was equal to two-thirds of the amount consumed by the lot receiving hay only. The average daily gain per head was 0.83 lb. in the lot receiving hay only when consuming an average daily ration of 13.22 lbs. The other lot made an average daily gain of 0.9 lb. and consumed daily per head 8.38 lbs. of hay and 14.13 lbs. of silage. The calves, which showed little difference in condition at the end of the wintering period, were turned on native pasture for 149 days, during which time the lot wintered on hay only made average daily gains of 1.46 lbs. as compared with 1.67 lbs. by the other lot. The combined results of the winter and summer feeding showed that the calves wintered on hay and silage made 13 lbs. greater gains per head during the entire experiment.

Mixed hay v. mixed hay and sunflower silage for winter feeding beef calves without grain: Experiment No. VII.—One lot of 11 calves was wintered on alsike clover and timothy hay during the first 60 days of a 147-day test, followed by the feeding of coarse red clover hay during the rest of the experiment. Another lot received similar hay with sunflower silage. The average daily gains made by the two lots were 1.01 and 1.1 lbs. per head, respectively, the average feed consumption in the former case being 12.8 lbs. of hay per day and in the latter lot 11.39 lbs. of hay and 7.19 lbs. of silage. The silage-fed calves shed their coats earlier and had a better appearance than the other lot. During a 140-day pasturing period following the winter feeding, average daily gains of 1.4 and 1.3 lbs. per head were made by the calves formerly receiving hay only and hay and silage, respectively. The combined results for the three years of silage feeding indicate that there was practically no difference between the value of the hay alone and hay and sunflower silage rations. Rations of mixed timothy and alsike clover hay also proved practically equal to alfalfa hay.

Finishing baby beef, G. A. Brown and G. A. Branaman (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 6–9*).—In continuing the comparative study of rations for baby beef (E. S. R., 52, p. 72), three lots of 10 heifers, each averaging approximately 370 lbs. in weight, were fed in a 190-day experiment during the winter of 1924–25. All lots received a basal ration full-fed of corn silage and alfalfa hay, with mineral supplements. The grain ration consisted of equal parts of shelled corn and whole oats during the first 60 days, 3 parts of corn to 1 part of oats during the next 30 days, and corn alone during the last 100 days. Oil meal was furnished to lots 1 and 2 at the rate of 1 lb. per day during the first 90 days, 1.5 lbs. per day during the next 60 days, and 2 lbs. per day for the rest of the period. The grain was self-fed to lot 1 for the first 30 days, while lot 2 was hand-fed throughout approximately two-thirds the amount of grain given to lot 1 up to the last 60 days during which nearly full-feeding was practiced. Lot 3 received no oil meal, but an amount of grain equal to the grain and oil meal given to lot 2.

The average daily gains made were lot 1, 2.13 lbs.; lot 2, 2.04 lbs.; and lot 3, 1.9 lbs. The amounts of the different feeds required per 100 lbs. of gain showed considerable variability, but the calculated costs of feed per 100 lbs. of gain after deducting for the pork produced for the 2 pigs in each lot were $13.23, $11.77, and $11.17, respectively, for lots 1, 2, and 3. The finish of the heifers was somewhat better in lots 1 and 2, as their value was estimated at $11 as compared with $10.50 per hundred for lot 3. The calculated returns per bushel of corn were for lots 1, 2, and 3, respectively, $1.20, $1.47, and $1.40.

Salting the ewes (*Iowa Sta. Rpt. 1924, p. 24*).—A summary of the record of the salt consumption of pregnant ewes over a period of seven winters (E. S. R., 51, p. 469) showed that the best results occurred when the ewes were allowed salt in self-feeders. The consumption under such conditions ranged from 0.25 to 0.5 oz. per ewe daily. Larger amounts of salt included in the ration tended to reduce the gains of the ewes and decrease the vigor of the lambs.

[Swine feeding experiments at the Arizona Station], R. H. Williams and E. B. Stanley (*Arizona Sta. Rpt. 1922, pp. 211–213*).—The results of the following experiments in swine feeding are briefly reported:

Alfalfa as a supplement to cracked hegari and tankage for pigs.—Five lots of 6 pigs, each averaging 70 lbs. in weight, were selected for comparing various concentrates when fed with alfalfa pasture. Lot 1 received alfalfa pasture only with concentrates, lot 2 was self-fed a mixture of cracked hegari and tankage, 9:1, without alfalfa pasture, lot 3 received the same concentrate

mixture with alfalfa pasture, lot 4 received the same concentrate mixture hand-fed at the rate of 1 per cent of the live weight, with alfalfa pasture, and lot 5 received the same mixture with alfalfa hay ad libitum.

The results showed that the pigs did not thrive on good alfalfa pasture alone, as their average daily gains were only 0.41 lb. during a period of 63 days. The lot self-fed without pasture made average daily gains of 1.91 lbs. The most rapid gains were made by the self-fed lot receiving alfalfa pasture, 2.31 lbs. per day. These pigs reached an average weight of 200 lbs. in 56 days. The pigs receiving the concentrates self-fed with alfalfa hay made average daily gains of 2.14 lbs., while the hand-fed pigs on alfalfa pasture gained only an average of 0.67 lb. per day.

Cracked hegari and tankage for developing gilts.—Two gilts, fed in dry lot from September 14, at which time they were 5 and 4 months old, respectively, on a ration of cracked hegari and tankage, 9:1, self-fed until November 16 and later hand-fed on the same ration, could not be gotten with pig. One of the gilts later died on alfalfa pasture.

Garbage alone v. garbage and alfalfa pasture for fattening pigs.—One lot of 6 70-lb. pigs when fed for 77 days on garbage supplemented with alfalfa pasture made average daily gains of 1.73 lbs. per head, while another lot receiving garbage only gained an average of 1.64 lbs. per head daily. The gains of the lot receiving pasture were calculated to cost approximately $1 more per 100 lbs. The dressing percentages of the two lots were equal (74 per cent).

Skim milk as a supplement to cracked hegari and alfalfa pasture for growing pigs.—Lots of pigs averaging 56 and 57 lbs. were selected for comparing the feeding value of a ration of cracked hegari self-fed and alfalfa pasture with a similar ration supplemented with skim milk during a 77-day test. The pigs receiving the skim milk made average daily gains of 1.6 lbs. as compared with 1.24 lbs. by the lot receiving no skim milk. It required 314 lbs. of cracked hegari to make 100 lbs. of gain in the latter lot as compared with 254 lbs. of cracked hegari and 437 lbs. of skim milk in the former. Four hundred and thirty-seven lbs. of skim milk thus replaced 60 lbs. of cracked hegari.

[Swine feeding experiments at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 17–22, 62, 63*).—The results of several experiments with swine are briefly reported.

Feeding iodine to growing and fattening pigs.—The results of three years' trials are given in which the effect on the rate and economy of gains of additions of 0.1 and 0.05 per cent of potassium iodide to the mineral mixture of fattening pigs was determined. The average daily gains made in the three years by the pigs receiving no iodine were 1.23, 1.52, and 1.37 lbs., respectively, as compared with 1.33, 1.65, and 1.55 lbs. by similar lots receiving iodine in the respective years. The feed requirements per unit of gain were also reduced about 10 per cent as a result of the iodine feeding.

Hogging down corn.—The gains of 143-lb. pigs hogging down corn with tankage, soy beans, tankage and soy beans, rye and tankage, or rape and tankage were compared with another lot receiving corn and tankage hand-fed, with rape pasture. The lots hogging down corn all made more economical gains than the check group. The soy beans were not sufficient to balance the corn rations. Soy beans, however, produced cheaper pork than when rye or rape were sown with the corn.

Soy bean forage for fattening pigs.—Studies of the use of various varieties of soy beans as forage crops in comparison with other forages resulted in more economical gains in pigs on rape or when fattened in dry lot.

Simple v. complex mineral mixtures for fall pigs.—In continuing the investigation of minerals (E. S. R., 51, p. 470), comparative studies of the simple mineral mixture of salt, limestone, bone black, and potassium iodide and the more complex mineral mixtures indicated that the complex mixtures were slightly superior. The time for attaining a weight of 225 lbs. was reduced from 111 to 103 days and the rate of gain was increased from 1.28 to 1.39 lbs. per day with the use of the complex mixtures. The feed required per unit of gain was also less.

In further experiments (1924), a complex mineral mixture was also somewhat superior when vegetable proteins were included in the ration. A particularly beneficial effect of salt was evident, but in all cases the feed requirements were reduced when mineral supplements were available. Pigs allowed sulfur alone seemed to eat too much, but when mixed with other minerals sulfur was beneficial.

Type test with swine.—From observations and experience with this project since 1917, it is concluded that "what is needed in now-a-day economic pork production is a combination of the smooth, thickly meated, capacious 'middled,' not too heavily boned medium type conformation and the rapid growth impulse of the big type in the development of the superior swine which should develop rapidly with a near minimum of feed."

[Swine feeding experiments at the North Carolina Station] (*North Carolina Sta. Rpt. 1924, pp. 10, 46–48, 50–54, figs. 3*).—These investigations are mainly continuations of those previously noted (E. S. R., 51, p. 871).

Soft pork investigations, J. O. Halverson, F. W. Sherwood, and H. A. Dickert.—Several projects dealing with the effect of peanuts on soft pork have been undertaken. The results indicate that this feed produces a very marked softening of the pork of young pigs, the degree of softness, however, depending on the length of the feeding period. The softening effects of peanuts and soy beans can be partially overcome by furnishing such feeds as corn, digester tankage, and rice products. Six pigs averaging 45 lbs. in weight and receiving as much as 140 lbs. of shelled peanuts killed hard.

[*Experiments at the*] *Swine Research Farm, Raleigh*, J. T. Keesee.—Six lots of pigs were used for comparing the value of a permanent pasture consisting of orchard grass and clovers with a temporary pasture consisting of oats, followed by soy beans for carrying pigs from weaning to 200 lbs. in weight with grain supplements furnished at the rate of 2 or 3 per cent of the live weight or in self-feeders. The results showed that a check lot self-fed in dry lot required approximately the same number of days to reach 200 lbs. in weight as lots self-fed on the permanent or temporary pastures. The lots receiving the limited grain rations did not gain as rapidly. In soft pork studies, pigs were fed varying amounts of peanuts and rice in different ways. When pigs received equal amounts of peanuts and rice fed separately, they killed harder than when the two feeds were mixed and fed together. Sixty-five-lb. pigs fed peanuts for 8 weeks produced soft and oily carcasses, but other pigs similarly fed but finished for 20 weeks on corn and brewers' rice produced satisfactory carcasses in most cases.

[*Experiments at the*] *Upper Coastal Plains Branch Station, Rocky Mount*, R. R. Currin, jr., and L. A. Page.—In studying the value of various crops for hogging down purposes, it was found that 1 acre of corn and soy beans, with the addition of 148 lbs. of fish meal, produced 838 lbs. of pork. One acre of immature corn, together with 100 lbs. of fish meal and 21 lbs. of mineral mixture was required to produce 457 lbs. of pork.

[*Experiments at the*] *Blackland Branch Station, Wenona*, J. L. Rea, jr., and A. P. Lefevers.—Eighty-lb. pigs grazing on soy beans supplemented with a 2

per cent ration of corn produced 395 lbs. of pork per acre and required 337 lbs. of corn and 21 lbs. of minerals. In comparing the value of soy bean meal and fish meal as supplements to corn in dry lot, all feeds being self-fed, it was found that the pigs receiving soy beans consumed three times as much of the protein supplement as the pigs receiving fish meal, though the total feed consumption per 100 lbs. was practically the same. In a repetition of this experiment, the pigs receiving soy bean meal made less gains and required 58 lbs. more feed to produce 100 lbs. of gain than the pigs receiving fish meal.

[*Experiments at the*] *Piedmont Branch Station, Statesville*, F. T. Meacham and G. A. Berry.—Studies of the feeding of red clover pasture when supplemented with corn and fish meal self-fed showed that 319 lbs. of grain were required to make 100 lbs. of gain in addition to the clover pasture.

Raising orphan pigs, II, J. M. Evvard, Q. W. Wallace, and G. V. Glatfelter (*Iowa Sta. Research Bul. 83 (1925), pp. 93–134, figs. 5*).—The results of three series of experiments in raising orphan pigs are reported in continuation of those previously noted (E. S. R., 50, p. 172).

Modifying cows' whole milk with sugar and cream.—An attempt was made to modify cow's milk by the addition of cane sugar and cream to the approximate composition of sow's milk in sugar and fat. The experiment lasted 135 days. During the first 5 days the 8 21-day-old pigs were fed on whole pasteurized cow's milk. During the next 100 days 2 pigs received whole pasteurized cow's milk, 2 received whole pasteurized cow's milk plus 2 lbs. of cane sugar per 100 lbs. of milk, 2 received whole pasteurized cow's milk plus 20 parts of from 16 to 20 per cent cream per 100 parts of milk, and 2 pigs received whole pasteurized cow's milk plus the amounts of sugar and cream added in the above lots. All animals received soaked shelled corn hand-fed and dry shelled corn, meat meal tankage, and salt self-fed after the first 10 days of the experimental period. During the final 30 days the milk was discontinued.

The 2 pigs receiving the whole milk to which was added cream died, one a few days after the experiment started and the other at the fiftieth day when he weighed 26 lbs. as compared with an average of 22 for the whole milk lot, 19 for the sugar-fed lot, and 13 lbs. for the lot receiving the supplements of both sugar and cream. The average daily gains during the experimental period of 100 days for the remaining lots were 0.864 for the check group, 0.611 for the group receiving milk modified with sugar, and 0.291 lb. for those receiving milk modified with both sugar and cream. The calculated dry feed equivalent consumed per 100 lbs. of gain was 212, 227, and 273 lbs., respectively.

The pigs receiving the unmodified milk required less protein per 100 lbs. of gain than the others. These results, as well as the measurements of the pigs, showed that the modified milk was less satisfactory than unmodified cow's milk for orphan pigs. The latter ration produced a thrifty appearance of the pigs throughout the experimental period, while those receiving milk modified with sugar and cream were in a rather emaciated condition. During the final period of 30 days, the pigs previously receiving unmodified milk remained superior as far as condition and appetite were concerned, as well as in gains in body weight.

Heat treatment of cows' whole milk.—The relative efficiency of raw milk and milk pasteurized, heated to the boiling point, and boiled for 5 minutes was studied in this experiment, using 4 lots of 2 pigs each averaging approximately 5 lbs. in weight. All received raw milk during the first 10 days, followed by 90 days' feeding on the milk heated to different degrees as described. Shelled corn, meat meal tankage, and salt were fed throughout. One pig receiving pasteurized milk died on the thirty-sixth day, and 1 receiving milk brought to a boil died on the fiftieth day. The average daily gains and the feed con-

sumption per 100 lbs. of gain, calculated on a dry matter basis, were, respectively, for the check lot 0.807 and 291 lbs., for the 1 pig receiving pasteurized milk 1.047 and 248 lbs., for the 1 pig receiving milk brought to a boil 0.698 and 331 lbs., and for the 2 pigs receiving boiled milk 0.835 and 286 lbs. Some scouring was evident in the pig receiving milk brought to the boiling point, and 1 of the pigs receiving boiled milk showed signs of stiffness and lack of vigor at the ninetieth day.

There was little difference in the condition and quality of the animals at the end of the expriment. The crude protein consnmed per 100 lbs. of gain was 73 lbs. for the lot receiving whole milk, 59 lbs. for pasteurized milk, 91 lbs. for milk heated to the boiling point, and 60 lbs. for boiled milk. The average daily gains during the 30-day period following the milk feeding were for the lots previously receiving raw, pasteurized, heated, and boiled milk 1.29, 1.52, 1.18, and 0.767 lbs., respectively. During this period the feed requirements per 100 lbs. of gain were, respectively, 395, 218, 396, and 502 lbs. Increases in size as determined by body measurements showed little difference in the after effect of the raw and heated milk.

Vitamin modification of cows' whole milk.—The advisability of adding vitamin supplements to rations of cow's milk for orphan pigs was investigated in this experiment. Ten pigs all 10 days of age were selected from the same litter and individually fed on whole pastenrized cow's milk three times daily during the first 30 days and twice daily during a second 30 days. Different sources of vitamins were supplied daily per pig to 2 pigs as follows: Juice of 1 orange, 1 hen's egg, 5½ oz. of tomato jnice, and 10 gm. of wheat embryo. Two pigs receiving no vitamin supplements were used as controls. All re-received shelled corn, 60 per cent protein tankage, and salt self-fed. At the end of 60 days the milk and vitamin supplements were discontinued, but the pigs were fed for a further 30 days on the grain ration.

The results showed that those receiving the vitamin supplements had gained over the controls in live weight both during the period of 60 days and in the following 30-day period when the milk and vitamin feeds were discontinued. This was also mainly true of body measurements. The average daily gains for the controls during the first 60 days and the following 30 days were, respectively, 0.410 and 0.837 lb. The gains of the gronps receiving the vitamins were for the two respective periods with orange juice 0.563 and 1.339 lbs., with eggs 0.579 and 1.267, with tomato juice 0.563 and 1.309, and with wheat embryo 0.453 and 1.079 lbs. The feed consumption of the vitamin-fed pigs was also greater during both periods of the test, but the feed required per 100 lbs. of gain was less in the control group during the first 60 days, but greater during the last 30 days.

The calculated crude protein required per unit of gain was greatest in both periods for the control lot. The average amount per 100 lbs. of gain for the 90-day test was 85 lbs. for the controls, 57 lbs. for the pigs receiving orange juice, 76 lbs. for the pigs receiving eggs, 63 lbs. for the group receiving tomato juice, and 64 lbs. for the pigs receiving wheat embryo. The pigs of the control lot were somewhat inferior to the other animals in general appearance and condition. It is pointed out that the pigs receiving wheat embryo were not as high grade animals at the start as those selected for the other groups.

Studies in iodine feeding.—I, Potassium iodide feeding beneficial to young swine, J. M. EVVARD and C. C. CULBERTSON (*Iowa Sta. Research Bul. 86 (1925), pp. 181–220, figs. 23*).—This is a more complete account than was noted above of three experiments in supplementing the rations of swine with iodine. A review of the sectional occurrence of goiter and the relation of the iodine

content of the water in the northern portion of the United States is also included.

[Poultry experiments at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 27–33*).—Brief reports of the experiments conducted in 1924 are given. Earlier results of many of the investigations have been noted (E. S. R., 51, p. 471).

Type as a basis for selecting pullets for egg production.—Observations of the pullets at the time they were placed in the laying pens indicated considerable differences in the stage of maturity. The immature birds differed in type from the more mature ones, being small, thin fleshed, light in weight, low in vigor and vitality, and of poor constitution. These characteristics were evidenced in the usual way, and the birds also lacked in breast and body development and in capacity. The early maturing birds were the best producers and laid during the first winter.

Effect of molt on egg production.—High producers have been found to normally molt late, but changes in the feed or a lack of animal proteins tend to result in early molting. The time required for molting and egg production were found to be closely correlated.

Rate of growth in chicks.—A study of several methods of rearing chicks showed that the best results were obtained when the only drink consisted of semisolid buttermilk. Rolled oats and mash were given sparingly during the first week, and grain was started during the second week.

Value of clam and oyster shells for poultry.—No differences in the consumption, texture of the eggshells, or numbers or size of the eggs were evident between the lots receiving oyster shells and clam shells.

Comparative value of dried, semisolid, and fresh buttermilk in crate fattening poultry for market.—In crate fattening experiments the values of dried, semisolid, and liquid buttermilk were compared as supplements to a grain ration, using 8 lots of birds. The gains were directly proportional to the amount of buttermilk solids supplied.

Comparison of dried buttermilk, fresh buttermilk, skim milk, tankage, and meat scrap as a source of animal protein for laying hens.—Five pens of 25 pullets each were used for comparing the value of different milk products for egg production. The following amounts of milk products were supplied per pound of mash in the different pens: Four lbs. of skim milk, 4.5 lbs. of liquid buttermilk, 1.25 lbs. of semisolid buttermilk paste, and 0.25 lb. of dried buttermilk. One pen received no animal protein. The largest numbers of eggs were produced by the pens receiving skim milk and semisolid buttermilk, 146 and 143 eggs, respectively. The production of the other pens was dried buttermilk 129, liquid buttermilk 126, and no animal protein 41 eggs. It is concluded that 23 lbs. of semisolid buttermilk was equivalent to 82 lbs. of skim milk and better than 88 lbs. of liquid buttermilk and 4.495 lbs. of dried buttermilk.

Comparison of skim milk, fresh buttermilk, semisolid buttermilk, dried buttermilk, tankage, and 70 per cent crackling scraps as a source of protein for laying hens.—In comparing various animal proteins for laying hens the average egg production when the different proteins were added to the basal ration was skim milk 89, liquid buttermilk 96, semisolid buttermilk 101, 15 per cent dried buttermilk 93, 15 per cent of 60 per cent protein tankage 67, 15 per cent of 70 per cent protein crackling meal 91, water and liquid buttermilk 73, and no protein supplement 34 eggs.

Use of artificial light to increase egg production.—Lights used in November on a culled flock were found to increase egg production 50 per cent within 2 weeks. This increased production was maintained over a 2 months' period. Light used in the evening on the breeding flock in January and February

stimulated egg production and did not interfere with fertility or the hatchability of the eggs.

[Poultry experiments at the North Carolina Station], B. F. Kaupp (*North Carolina Sta. Rpt. 1924, pp. 11, 65*).—These investigations are partial continuations of those previously noted (E. S. R., 51, p. 874).

Lights v. no lights.—The annual egg production of pullets was increased 50 per cent by furnishing electric lights from November 1 to April 1, making 14 feeding hours daily.

Meat meal v. fish meal.—In a repetition of this experiment from the previous year fish meal was again found equal to meat meal.

Effect of latitude on egg production.—In the cooperative studies with the Manitoba Agricultural College the half of the flock at Raleigh produced 35 more eggs per hen than the birds at the Canadian institution. The birds at Raleigh were 0.5 lb. heavier and more loosely feathered and fleshed.

Soy bean oil meal in rations for laying pullets, A. G. Philips and S. M. Hauge (*Indiana Sta. Bul. 293 (1925), pp. 20, figs. 9*).—This is a more complete report of the experiments in which tankage and soy bean oil meal fed with and without minerals were compared as protein supplements for egg production, preliminary results of which have been previously noted (E. S. R., 53, p. 172). The results of a fourth trial are also included.

The experiments showed that minerals supplying calcium, phosphorus, sodium, and chlorine were essential supplements to the soy bean oil meal rations, but they did not appear to be necessary when tankage was used as the source of protein. The most satisfactory mineral supplement to the soy bean oil meal consisted of 24 lbs. of limestone, 15 lbs. of salt, and either 21 lbs. of soluble bone, 22 lbs. of steam bone, or 42 lbs. of acid phosphate.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 25, 26, 61, 62*).—The results of feeding experiments are reported, partly in continuation of those previously noted (E. S. R., 51, p. 474).

Soy beans with corn for silage.—A test of the comparative value of corn silage and corn and soy bean silage showed 1.9 per cent in favor of the latter when based on the amount of milk produced.

Summer silage to supplement pastures.—By bringing the cows from pasture for silage feeding at noon daily it was found possible to maintain weight and milk production during the summer months, and the extra cost is deemed justifiable.

Alfalfa and sweet clover hays.—In comparing alfalfa and sweet clover hay in a 90-day trial both were found to be of equal value for milk production.

The value and economy of oil meal.—The addition of oil meal as one-third of the concentrates to a ration of silage, alfalfa hay, corn, and oats resulted in a 9 per cent higher milk and 4 per cent higher fat production than when the oil meal was omitted. The cows lost 3 per cent in weight during the 40 days when no oil meal was fed. The total feed cost was 21 per cent less without oil meal.

Arkansas cattle improvement project.—A few third-generation Holstein grades have been produced in this project, and they, as well as the second-generation individuals of all breeds, continue to show improvement in each generation (E. S. R., 49, p. 779).

Dairy cattle investigations [at the Fort Hays Substation], 1924–25 (*Kansas Sta., Fort Hays Substa. [Pamphlet], 1925, pp. 5*).—In a third trial of the comparative value of alfalfa and Sudan hay for milk production, 8 Hol-

stein cows were selected for a test during three 30-day periods. The feeds used were similar to those employed in an earlier trial (E. S. R., 51, p. 77), and the results likewise indicated some superiority for the alfalfa hay in the production of milk and butterfat. The milk production was 8 per cent greater and the butterfat production 10 per cent greater with this hay than wih Sudan hay. The live weights of the cows used were practically constant throughout. The cows consumed over 2 lbs. per head daily more of the alfalfa than of the Sudan hay.

The importance of well cured hay in the ration of dairy cattle, O. E. REED and C. F. HUFFMAN (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 10–15, figs. 4*).—In studying the cause of malnutrition in dairy cattle on rations lacking hay, the effect of adding fiber in the form of wheat straw was investigated. Four yearling heifers were given a basal ration of yellow corn, corn gluten, cottonseed meal, and salt, and were allowed daily exposure to sunlight in open yards. Two of the heifers received all the wheat straw they would eat, while the wheat straw for the other two was limited to 5 per cent of the ration. One of the latter died in 270 days of convulsions, while the other calved prematurely. Of the 2 receiving all the wheat straw they would eat, one calved prematurely and the other became stiff in the joints, the legs swelled, the coat and eyes were dull, and the hide was tight after 1 year. Feeding 0.25 lb. of cod liver oil daily for 4 days and 0.25 lb. per week thereafter restored the condition of the heifer, but her calf was born blind and paralyzed. One of these animals and 4 others on rations supposed to be adequate in energy, protein, vitamins, and minerals, but without hay, had not shed their winter coats by July 11. It is assumed that the ration must contain green feed or well-cured hay before sunshine can help the animal to shed. Five other heifers on a mineral supplement each received a mineral mixture detrimental to their health and did not shed their coats normally.

A study of essential plant foods recoverable from the manure of dairy cows, C. F. WELLS and B. A. DUNBAR (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 985–988*).—The results of a study of the amounts of potash, phosphoric acid, and nitrogen recovered in the manure from the feed of four dairy cows in two 5-day trials are reported from the South Dakota Experiment Station. The basal ration fed in both trials consisted of corn silage, oats, corn, and oil meal, with soy bean hay in the first trial and alfalfa hay in the second. The cows were of four breeds, Jersey, Ayrshire, Guernsey, and Holstein. The percentage of fertilizing constituents recovered from the feed, as well as the daily milk production, was as follows:

Milk production and fertilizing constituents recovered from the feed

Cow	Average daily milk production		Fertilizing constituents recovered					
			K_2O		P_2O_5		N	
	First trial	Second trial	First trial	Second trial	First trial	Second trial	First trial	Second trial
	Lbs.	*Lbs.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Jersey	24.16	20.74	61.59	82.74	43.64	32.51	61.26	72.20
Ayrshire	22.66	23.36	95.76	94.15	50.46	35.73	71.98	74.10
Guernsey	18.44	18.92	77.14	88.91	49.63	32.78	68.98	69.25
Holstein	25.42	23.58	58.05	78.31	44.27	29.06	61.91	68.25

It is concluded that the dairymen may expect to recover approximately four-fifths of the potash, two-fifths of the phosphates, and two-thirds of the nitrogen of the feed for fertilizing purposes.

Studies on conformation in relation to milk producing capacity in cattle.—IV, The size of the cow in relation to the size of her milk production, J. W. Gowen (*Jour. Agr. Research [U. S.], 30 (1925), No. 9, pp. 865–869, fig. 1*).—In continuing this series of investigations (E. S. R., 51, p. 577), a study has been made of 385 early Advanced Registry records of Holstein-Friesian cattle with which were included the age, measurements of the height at the shoulders, height at hips, body length, rump length, body width, thurl width, and body girth. The weights of 339 of the individuals were also included. Correlation coefficients were calculated between the milk production and age and the various measurements of body size. The relations were also shown graphically, which indicated that the relation between milk production and the various measurements of body size was linear. The following linear equations were calculated as equivalent to the 7-day milk yield: 14.2 shoulder height —412.9; 13.1 hip height —366.5; 11.5 body length —374.1; 19.7 rump length —63.5; 21.9 body width —128.3; 225.8+5.9 thurl width; 7.4 girth —201.5; 23.8+0.289 weight. The measurements having the most influence on production and likewise on variation in the production were body length, body width, girth, and weight, while thurl width was the least important of the measurements taken.

Selecting foundation dairy cows, C. C. Hayden (*Ohio Sta. Mo. Bul., 10 (1925), No. 5–6, pp. 81–84, fig. 1*).—A discussion of building up a profitable dairy herd, in which it is pointed out that better results are likely to follow when a few good cows are selected for a foundation than when a good bull is used on a larger number of poor cows.

Feeding chlorinated milk to the albino rat, J. W. Read and H. Hale (*Jour. Agr. Research [U. S.], 30 (1925), No. 9, pp. 889–892, figs. 3*).—In conjunction with the experiments previously noted by Hale and Bleecker (E. S. R., 50, p. 679), male and female rats were fed over a 10-month period on a ration of equal parts of finely ground whole wheat and yellow corn, with 2 per cent of a mineral mixture and a liberal quantity of whole milk which had been modified by the addition of chlorine in amounts of 1 part of chlorine to from 3,000 to 15,000 parts of milk. No harmful effects on the growth or reproduction in the rats were observed from the feeding of milk treated with such amounts of chlorine, although the authors are not recommending the treatment of milk with active chlorine.

The bacteriological background of buttermaking.—III, Factory treatment of cream, G. L. A. Ruehle (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 45–47*).—In continuing this series of studies (E. S. R., 51, p. 79), the means of avoiding contamination in cream from factory utensils are discussed. Flash pasteurization of the cream after neutralization is recommended.

Studies on starters, I, II (*Iowa Sta. Research Bul. 85 (1925), pp. 161–179*).—The results of studies dealing with the effect of various factors on starters are reported.

I. *Influence on starters of air supply, temperature of incubation, and rate of ripening,* P. Toens and B. W. Hammer.—In making a study of the influence of air on the development of acidity and the quality of starters, samples were taken from cultures grown in cotton-stoppered Erlenmeyer flasks, wide-mouthed cotton-stoppered bottles, and in glass-stoppered bottles and inoculated into milk in the three different types of containers. Six starters carried in glass-stoppered bottles were used for inoculating milk in the three types of containers.

Acidity determinations on the developing starters showed that acid development was rapid in the container with a restricted air supply and decreased in rate as the air supply increased. The best flavor resulted when the air supply was greatest. Overripe flavors frequently accompanied the development of large amounts of acid, but with too small an amount of acidity the starters lacked flavor.

Nine starters were used in studying the flavor when the culture was grown in the same type of container as that in which the starter developed. These results showed that the poorest flavors and aroma occurred when the air supply was least limited. They frequently had a flat flavor and lacked aroma under such conditions. The best results occurred with a moderate air supply. Starters grown under a restricted air supply often had an overripe flavor, though this was frequently not accompanied by high acidity. This suggests the operation of factors other than acidity on the production of the overripe flavor.

In studying the effect of the developing temperature, starters were incubated at temperatures of 18, 21, 25, and 32° C. Some of the cultures were grown at the incubation temperature of the starter, while others were grown at 21° and the starters incubated at all the temperatures mentioned. These results showed that the incubation of starters at 18, 21, and 25° inoculated from cultures grown at 21° all proved equally good. A temperature of 32° gave the poorest results. In comparing starters inoculated with cultures grown at the same temperature, equally good results were obtained in all four cases, but when the starters were carried at 37°, the flavor and aroma were very unsatisfactory. Results with starters carried at 32° and with similarly inoculated starters warmed to the same temperature, but allowed to develop at variable room temperature, showed somewhat irregularly in favor of the starter kept uniformly at 32°.

A comparison of the effect of the time required for ripening starters showed that when coagulation occurred at from 6 to 8 hours at 21° the starters were slightly but significantly superior to starters ripening in from 16 to 20 hours at 21°.

II. *Acetone in distillates from starters and from milk*, F. F. Sherwood and B. W. Hammer.—In studying the volatile compounds in starters and milk, it was found that acetone was present in the distillate from both. Comparisons of the amount of acetone in milk and in starters indicated that the growth of the starter did not influence the acetone content. Other studies wih pure cultures of *Streptococcus lactis*, *S. cremoris*, *S. citrovorus*, and *S. paracitrovorus* indicated that no acetone was produced by these organisms.

[Experiments with dairy products at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 41, 42*).—The results of three experiments were reported.

The improvement of flavor and keeping quality of hand separator cream butter.—Sour cream pasteurized at 170° F. by the holding process produced a better butter than cream pasteurized at 140°, but the keeping qualities of the butter were reduced by the higher pasteurization temperature. Butter made from cream pasteurized at 180° had an overheated flavor. Neutralization of the cream was found to improve the quality of the butter for storage.

Studies on the yeasts in dairy products.—Yeasts have been found of practically no importance as causes of deterioration in butter, but the presence of large amounts of yeast in this product suggests unsatisfactory methods of manufacture and packing.

Bacterial flavors and odors in milk.—Noted on page 781.

VETERINARY MEDICINE

Laboratory manual in general and pathogenic bacteriology and immunity, V. A. Moore and W. A. Hagan (*Boston and London: Ginn & Co., 1925, pp. XII+252, figs. 39*).—This laboratory guide is an outgrowth of a smaller publication by the senior author in 1898, the last edition of which was published in collaboration with C. P. Fitch in 1914 (E. S. R., 31, p. 376). The present work has many of the features of the earlier editions, but has been rewritten entirely by the junior author. Part 1 (pp. 3–143) consists of exercises in general bacteriology and part 2 (pp. 144–245) of exercises in pathogenic bacteriology and immunity.

Military meat and dairy hygiene, compiled by H. S. Eakins (*Baltimore: Williams & Wilkins Co., 1924, pp. XVI+647, figs. 62*).—This is a compilation made under the direction of the Surgeon General for the information of the personnel of the veterinary and sanitary services of the Medical Department of the U. S. Army in performing the professional details of examining food products of animal origin in accordance with Army Regulations.

Virus diseases of animals, H. H. McKinney (*Phytopathology, 15 (1925), No. 4, pp. 189–192, 200, 201, 202*).—This is a brief review of the literature on the subject.

A group of microorganisms transmitted hereditarily in ticks and apparently unassociated with disease, E. V. Cowdry (*Jour. Expt. Med., 41 (1925), No. 6, pp. 817–830, pls. 3*).—Working in the laboratory of the Department of Agriculture of the Union of South Africa at Onderstepoort, under the auspices of the Rockefeller Institute for Medical Research, the author found pleomorphic, bacterium-like, Gram-negative, intracellular microorganisms, which stained much less intensely with ordinary dyes than most bacteria, to occur in 16 species of ticks representing both Argasidae and Ixodidae. The detection of the microorganisms in the eggs of 10 species, in the unfed larvae of 8 species, and at nearly related stages throughout the life cycle of 3 others leads to the conclusion that they are transmitted hereditarily.

Observations on the poisonous plants of Michigan, E. F. Woodcock (*Amer. Jour. Bot., 12 (1925), No. 2, pp. 116–131*).—This is a list of the poisonous plants of Michigan accompanied by notes on their distribution and poisonous nature where such information is available.

Mercurochrome-220 soluble in genito-urinary diseases, F. H. Redewill and J. E. Potter (*Jour. Amer. Med. Assoc., 84 (1925), No. 25, pp. 1891–1897*).—The results of intravenous treatment in 496 cases have led to the following conclusions:

"Mercurochrome-220 soluble is one of the most important new remedies for use in intravenous medication. This drug is excreted in large quantities by the kidneys and also secreted through the prostate, seminal vesicles, and other glands of the genito-urinary tract. Thus this dye comes in direct contact with the inflamed areas of this tract by way of the urine and blood stream. To obtain the best results, this remedy should be given in small enough doses to avoid a too early saturation. Patients who respond best to intravenous mercurochrome injections have mild reactions. Acute rheumatism, synovitis, myalgia, neuritis, arthritis, and other manifestations as a result of absorption from the prostate and seminal vesicles as sites of focal infection have cleared upon the intravenous administration of mercurochrome. A large number of acute gonorrheal urethritis, epididymitis, prostatitis, and seminal vesiculitis cases cleared up rapidly with this medication.

"The drug should be freshly prepared and given every 48 hours. Given judiciously, mercurochrome is one of the most efficient remedies to be used in

ambulatory cases; i. e., patients can be treated in the dispensary and the clinic. Expressed prostatic fluid and seminal fluid has decided bacteriostatic action. Patients showing a hypersensitiveness for intravenous mercurochrome injections will secrete a proportionally greater amount in the saliva and gastrointestinal tract than by way of the kidneys. By the use of the diphenylcarbazid test of mercury in the seminal fluid, and the mercurochrome kidney function test, it is possible with the first intravenous mercurochrome injection to detect patients that are not suitable for the continuous use of this drug."

Mercurochrome-220 soluble in infections of the genito-urinary tract.—A preliminary report, J. E. Potter (*U. S. Naval Med. Bul., 22 (1925), No. 5, pp. 542–553; abs. in Jour. Amer. Med. Assoc., 84 (1925), No. 25, p. 1961*).—The author finds that mercurochrome-220 soluble can be administered very advantageously in ambulatory cases by giving smaller doses over a longer period than usual with longer intervals between injections, and that definitely positive results may be obtained. His report is based on results obtained from treating 77 such patients.

The association of Bacillus bronchisepticus and Bacterium lepisepticum with rabbit snuffles, C. G. Bull and C. M. McKee (*Amer. Jour. Hyg., 5 (1925), No. 4, pp. 530–535*).—The authors report that *B. bronchisepticus* was by far the predominating organism in the bacterial flora of the nares and trachea of rabbits developing snuffles in their stock animal room, pure cultures of this organism often being obtained. *B. lepisepticum* appeared in small numbers in the cultures from 5 of these rabbits. An entire litter of baby rabbits was attacked by an acute and fatal form of snuffles. *B. bronchisepticus* was abundant in the cultures from all of these rabbits, while *B. lepisepticum* did not appear in any of the cultures. Cultures made from the nostrils of 18 rabbits of an isolated colony passing through an epidemic of snuffles gave an abundant growth of *B. bronchisepticus*, while *B. lepisepticum* could not be isolated from any of the cultures. Cultures from one rabbit gave neither *B. lepisepticum* nor *B. bronchisepticus*.

Pathogenicity of Clostridium botulinum, W. A. Starin and G. M. Dack (*Jour. Infect. Diseases, 36 (1925), No. 4, pp. 383–412*).—The authors find that detoxified spores of *C. botulinum*, both A and B types, are capable of multiplication in the body of animals and of producing a potent toxin in amounts sufficient to induce experimental botulism. The number of spores necessary to accomplish this is quite large, and it is doubtful if the introduction of detoxified spores would be of any significance in the problem of human botulism.

"The spores of *C. botulinum* may remain latent in animals for long periods of time and still be viable. In some instances, viable spores were recovered from the contents of collodion sacs four months after their introduction into the body. *C. botulinum* was isolated from the different organs of the body after death from botulism following introduction of detoxified spores. The distribution was widespread, although the highest percentage of positive results was found in the liver, kidneys, spleen, and cecum. Organs of animals dying from experimental botulism following the introduction of detoxified spores, when macerated in salt solution, never were found to contain botulinus toxin.

"Antibody formation agglutinins in animals receiving detoxified spores could be demonstrated. Antitoxins were never demonstrated by testing the serum of such animals in vitro, and only in one case by any change occurring in the resistance toward the toxin in vivo. So-called 'kataphylactic' agents, such as calcium chloride, quinine, hydrochloride, which have been found to modify the pathogenicity of the spores of *C. tetani*, did not exert any influence on the

pathogenicity of the spores of *C. botulinum*, even when given in quantities large enough to produce necrosis. In addition to the lesions ordinarily described as characteristic of botulism, attention is called to the marked stasis observed in the urinary bladder, the gall bladder, and the stomach, resulting in an icteric condition of the tissues and in necrosis and rupture of the stomach wall.

"Collodion sacs were employed successfully in the study of pathogenicity of *C. botulinum* and furnished definite evidence of the multiplication and toxin production of the organism in the body of animals."

Vaccination against diphtheria and fowlpox with antidiphtherin, T. VAN HEELSBERGEN (*Vet. Rec., 5 (1925), No. 24, pp. 481–483, fig. 1*).—This is an account of the method of De Blieck and Van Heelsbergen. After experimenting for over three years, these investigators have succeeded in preparing a live vaccine, unattenuated physically or chemically, which is especially suitable for preventive purposes. Applied as a cutaneous vaccination it protects for a long time against experimental as well as against spontaneous infection.

A study of skin tuberculosis, C. M. CARPENTER and S. A. GOLDBERG (*Cornell Vet., 15 (1925), No. 2, pp. 148–155, pls. 4*).—The authors find that the cutaneous lesions described in cattle are identical with skin tuberculosis (lupus vulgaris) in man, and that the inoculation of a small amount of a culture of the bovine tubercle bacillus into the skin of cattle produces lesions identical with those that have come to their attention from natural infection. Taking as a basis the 30 cases which they have studied up to the present, the percentage of reactors to the skin form is approximately the same as the percentage of reactors to tuberculosis in other organs.

Pneumonia associated with Bacillus abortus (Bang) in fetuses and newborn calves, T. SMITH (*Jour. Expt. Med., 41 (1925), No. 5, pp. 639–647, pls. 2*).—The author describes for the first time a pneumonic condition in fetuses and newborn calves due to *B. abortus*. Its character, extent, and bearing on the epidemiology of pneumonia are discussed.

The significance of colostrum in the prevention of the diseases of young calves, T. SMITH (*Cornell Vet., 15 (1925), No. 2, pp. 173–180*).—A review of the subject with references to the literature.

The sheep stomach worm, G. H. LAMSON, JR. (*Connecticut Storrs Sta. Bul. 128 (1925), pp. 211–251, figs. 8*).—This summary of information on *Haemonchus contortus* Rud. includes the details of control work, in which (1) a water-soluble solution of iodine, (2) 40 per cent nicotine sulfate, (3) tobacco dust, (4) chenopodium, and (5) copper sulfate were used. Copper sulfate was found to be less effective than nicotine or iodine, and the combination of copper sulfate and nicotine gave variable results. Tobacco dust was found to be variable in nicotine content, and steeping it over night made another variable so that the nicotine content was uncertain. While 40 per cent nicotine sulfate has given many satisfactory results and is being commonly used, it has some objectionable features, particularly in drenching lambs and weak sheep. Iodine promises to be one of the best, if not the best, vermicide for sheep stomach worms, since a water-soluble solution of iodine made up of Lugol's Solution and water can be used that will kill both the mature and the immature worms.

The author concludes that little or no dependence can be placed upon copper sulfate, nicotine sulfate, and iodine as they are now recommended as a means of controlling the tapeworms in sheep. Iodine can be used to kill the immature worms in lambs and in pregnant ewes if necessary, it being better to treat pregnant sheep early in pregnancy unless they show marked symptoms of stomach worm infestation. The rotation of pastures and cultivation of forage

crops aids greatly in reducing the number of stomach worms in fields, making fewer treatments of the sheep necessary. It is concluded that, with good pastures and the proper administration of iodine as a vermicide, sheep can be kept with little or no loss from stomach worms.

Ill effects from the injection of Bayer 205 into dourine affected stallions [trans. title], H. VELU, J. BAROTTE, L. BALOZET, and G. LAVIER (*Ann. Parasitol. Humaine et Compar., 3 (1925), No. 1, pp. 12–20, fig. 1; abs. in Trop. Vet. Bul., 13 (1925), No. 2, p. 44*).—The author reports upon the toxic effects of Bayer 205, which resulted in the death of one stallion.

"Haemogregarina canis," M. A. NARAYAN RAU [RAO] (*Vet. Jour., 81 (1925), No. 600, pp. 293–307, pls. 2, fig. 1*).—The author finds that the changes in the spleen, liver, bone marrow, and kidneys in dogs naturally infected by *H. canis* as well as in experimentally infected dogs are constant, and that the train of symptoms is the same. The parenchymatous changes and the periglomerular cell infiltration in the kidneys are thought to be due to a slow poison circulating in the blood, which must be the toxin from this parasite.

[Diseases of poultry] (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 2, pp. 203–206, 207–228, 229–231, 232–238, 239–248, 249–259, 268–270, figs. 13*).—Contributions on diseases of poultry include the following: Fowl Pest, with Special Consideration of the Pathology of the Disease, by Freese, trans. by L. P. Doyle (pp. 203–206), previously noted from the original (E. S. R., 20, p. 584); Avian Postmortem Examinations, by J. W. Patton (pp. 207–212); A Classification of Poultry Mortality, with Data from Five Hundred Autopsies, by B. F. Kaupp and R. S. Dearstyne (pp. 213–222); Goiter in Poultry, by H. C. H. Kernkamp (pp. 223–228); Tracheo-laryngitis in Poultry, by H. G. May and R. P. Tittsler (pp. 229–231); Ulcerative Cloacitis in Chickens, by M. Scherago (pp. 232–238); The Tuberculin Test in Avian Tuberculosis, by E. L. Stubbs (pp. 239–248); The Differential Diagnosis of Fowl Cholera and Fowl Typhoid, by B. F. Kaupp and R. S. Dearstyne (pp. 249–259); and Neoarsphenamine as a Remedy against Blackhead in Turkeys and Coccidiosis in Chicks, by S. Eriksen (pp. 268–270).

Bird ailments and accidents and how to treat them, C. ST. JOHN (*London: Cage Birds, new ed., pp. 106*).—A new edition of the handbook previously noted (E. S. R., 48, p. 486).

[Poultry disease investigation at the North Carolina Station], B. F. KAUPP (*North Carolina Sta. Rpt. 1924, pp. 63, 64*).—In studies of the effect of lactic acid in milk upon the disease-producing germs of fowls, it was found that the *Eberthella sanguinaria* of fowl typhoid would not grow in a medium of milk containing 0.7 per cent of lactic acid, while *Bacillus avicida* of fowl cholera and *Bacterium pullorum* of infectious or white diarrhea would not grow in 0.6 per cent lactic acid media.

[European fowl pest in the United States] (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 2, pp. 146–170, 171–177, 178, 179, 180–182, 183–185, 186–202, 273–275, figs. 8*).—A series of papers dealing with the outbreak and occurrence of this disease in America, here presented, includes the following: A Study on the Recent Outbreak of a Fowl Disease in New York City, by L. D. Krohn (pp. 146–170); Laboratory Observations on the Virus of the Malignant Disease Recently Epizootic among Poultry, by C. Krumwiede, H. Gerber, and D. J. Provost (pp. 171–177); Fowl Pest in Indiana, by R. C. Julien (pp. 178, 179); Fowl Plague in Pennsylvania, by E. L. Stubbs (pp. 180–182); European Fowl Pest in Illinois, by I. B. Boughton and E. A. Tunnicliff (pp. 183–185); Observations upon Fowl Plague in New Jersey, by F. R. Beaudette (pp. 186–194); European Fowl Pest in Michigan, by S. R. Johnson (pp. 195–202); and History of Fowl Pest Outbreak (pp. 273–275).

The effects of bacillary white diarrhea, H. CANFIELD (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 31, 32*).—A comparison made of the performance of infected and uninfected birds from a certain flock of hens indicated that an infected hen will lay 136 eggs per year while her uninfected sister is laying 166 eggs per year, a difference in production of 30 eggs per hen per year.

Blackhead and other causes of loss of turkeys in California, H. W. GRAYBILL (*California Sta. Circ. 291 (1925), pp. 14, figs. 4*).—Following a brief introduction, a general account is given of blackhead, based upon investigations at the Rockefeller Institute for Medical Research at Princeton, N. J., and while under assignment at the station. Brief accounts of several field trials in the artificial rearing of turkeys in the San Joaquin Valley in association with J. R. Beach of the station are included.

Very serious losses from causes other than blackhead were found to occur. Under the heading of faulty management, reference is made to the rouplike disease, or nutritional roup, of chickens and turkeys, shown by Beach to be due to vitamin A deficiency, resulting from a lack of green feed (E. S. R., 52, p. 77). Colds and roup commonly occur and lead to considerable loss. Fowl cholera has in the past led to serious losses among turkeys, and it was demonstrated during the year that fowl typhoid also causes serious losses. An intoxication which shows some resemblance to botulism occurred in a flock of 1,700, resulting in the death of 1,100 birds.

Diseases of the ruffed grouse, A. O. GROSS (*Auk, 42 (1925), No. 3, pp. 423–431*).—An affection due to nematodes of an apparently new species of Dispharynx, pulmonary mycosis, avian tuberculosis, and an unidentified disease observed in Connecticut are dealt with.

Report of investigations on an alleged epizootic of ruffed grouse in Michigan, H. J. STAFSETH and A. KOTLAN (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 2, pp. 260–267, fig. 1*).—Investigations were made during the fall of 1924 of a reported epizootic disease of grouse in the Upper Peninsula and in the northern part of the Lower Peninsula of Michigan. The authors were unable to detect any disease due to protozoan or metazoan parasites or bacteria. All birds, however, showed different, more or less pronounced lesions, indicating a mechanical injury.

Lungworms in foxes and their treatment, K. B. HANSON (*Amer. Fox and Fur Farmer, 4 (1925), No. 9, pp. 5, 6*).—This is a practical account prepared by an agent of the U. S. D. A. Bureau of Biological Survey.

Carbon trichloride as an anthelmintic, and the relation of its solubility to anthelmintic efficacy, M. C. HALL and E. B. CRAM (*Jour. Agr. Research [U. S.], 30 (1925), No. 10, pp. 949–953*).—Experiments here reported, in which carbon trichloride was administered (1) as coarse crystals in capsules, (2) as a fine powder in capsules followed or preceded by castor oil, (3) dissolved in castor oil, (4) dissolved in oil of chenopodium, and (5) dissolved in carbon tetrachloride, all indicate that it has no value as an anthelmintic. The failure of the chemical to display in actual practice the efficacy expected from its high chlorine content appears to be correlated with the great actual and relative insolubility of the chemical, the lack of solubility maintaining the anthelmintic chlorine constituent in an unavailable condition.

Factors which should determine the selection of an anthelmintic in a geographical area, F. L. SOPER (*Amer. Jour. Hyg., 5 (1925), No. 4, pp. 408–453, figs. 10*).—This account is based upon experimental and field work conducted in a campaign against hookworm infestation in Paraguay. In this, 419 cases were treated with carbon tetrachloride, oil of chenopodium, or a combination of these two drugs.

AGRICULTURAL ENGINEERING

Agricultural engineering [studies at the Iowa Station] (*Iowa Sta. Rpt. 1924, pp. 7–9*).—The studies for the most part continue those previously noted (E. S. R., 49 p. 788; 51, p. 482.)

Studies begun in 1914 to determine a satisfactory treatment for making silo walls impervious have shown that bitumen or asphalt applied in a way so as to insure a good bond is the most satisfactory method. All attempts to use plaster coats of various kinds have been generally unsuccessful at the end of 10 years.

Studies of silo capacities have shown that the storage capacity of silos evidently varies widely from year to year, due primarily to differences in the water content of the silage and to a less extent to the weight of the grain.

Studies of the economy of operation of farm implements, as revealed by draft, have shown that extreme sharpness of the plowshare has little influence on the draft of the plow in mellow soil. However, the draft was materially increased when a dull share was used in alfalfa sod. The average draft of a 14-in. plow working 5 in. deep with a sharp share was 740 lbs., while with the edge dulled to ⅛ in. thickness it was increased to 881 lbs. The sharpness of the share greatly influenced the ability of the plow to penetrate hard soil.

An experiment on masonry arch barn construction, which involved the design, construction, and testing to destruction of a 36-ft. reinforced concrete and clay block arch with a rise of 24 ft. 7 in., showed that the arch as designed was much stronger than required. The breaking stress required to cause failure was equivalent to the pressure created by a wind velocity of 160 miles per hour. These results are taken to indicate the possibility and practicability of building a barn of masonry material.

Experiments with L-shaped concrete blocks showed that a block with an 8 by 16 in. face could be made in a gang mold at a cost of 3.5 cts. for material and 1.5 cts. for labor.

A continuation of the studies of the durability of prepared roofing indicated that exposure to the sun is one of the most important deteriorating factors.

Brief data on the standardization of farm machinery and on a study of the horse as a motor are also included.

Daily river stages at river gage stations on the principal rivers of the United States, H. C. Frankenfield (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 22 (1924), pp. II+183*).—This is the twenty-second of these reports (E. S. R., 53, p. 83), and presents data for 1924.

Surface water supply of Colorado River basin, 1921 (*U. S. Geol. Survey, Water-Supply Paper 529 (1925), pp. V+181, pls. 2*).—This report, prepared in cooperation with the States of Colorado, Wyoming, Utah, and Arizona, presents the results of measurements of flow made on streams in the Colorado River basin during the year ended September 30, 1921.

Surface water supply of lower Columbia River and Pacific slope drainage basins in Oregon, 1921 (*U. S. Geol. Survey, Water-Supply Paper 534 (1925), pp. V+171, pls. 2*).—This report, prepared in cooperation with the States of Oregon and Washington, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1921.

Ground water fluctuations at Kearney Park, California (*Hilgardia [California Sta.], 1 (1925), No. 7, pp. 133–144, figs. 5*).—Data from eight years' observations on the fluctuations of the ground water table in Kearney Vineyard are reported and discussed.

Many of the wells were found to show rather erratic fluctuations due to irrigation. The water table was found to reach a point nearest the surface

during June, and during most of the year was well within the ideal root zone of plants. The feeding zone was found to be in reality the most restricted during the midsummer because of the position of the water table. It is considered probable that for the type of soil in the region, and with the shallow depth to the ground water, water will rise to the surface by capillarity during the entire year. During that part of the year when the temperatures are the most favorable for high evaporation the water table is nearest the surface. There must necessarily be a rapid accumulation of alkali at the surface under these conditions.

The seasonal fluctuation of the water table was found to be between 5 and 6 ft., and the most rapid rise occurred during March and April. As the season progressed the rate of rise was much less than in the early spring. There was very little fluctuation during June, and the water table receded in July. There appeared to be little or no tendency toward an annual increase in the height of the water table.

The significance of these findings in connection with the design of drainage and irrigation systems is discussed.

Annual report of the Dominion Water Power and Reclamation Service for the fiscal year ending March 31, 1924 (*Canada Dept. Int., Water Power and Reclam. Serv. Ann. Rpt. 1923-24, pp. 131, figs. 18*).—In addition to the water power data, reclamation data containing the usual duty of water results are presented in this report.

Irrigation [studies at the Arizona Station], G. E. P. SMITH, W. E. CODE, and H. C. SCHWALEN (*Arizona Sta. Rpt. 1922, pp. 229-234, fig. 1*).—Data are briefly summarized on ground water studies, stream flow measurements, pumping machinery, and other irrigation subjects.

Data on the effect of the transpiration of trees upon the ground water supply indicate correlations between the transpiration losses in a cottonwood and mesquite forest and climatic factors, including temperature, humidity, and cloudiness, for different stages of leaf growth. The daily fluctuations of the water table caused by the transpiration of trees and by recharge of the water supply are large, sometimes exceeding 5 in.

Tests of fuel oils for pumping are reported to have shown that, under the new process of cracking the crude oils now used by some refineries, the volatility of California cracked oil distillates is higher in relation to their specific gravities than that of straight run distillates. The cracked oils appear to have the same qualities as straight run oils of 3° B. higher gravity.

The Tempe drainage ditch, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1922, pp. 194, 195*).—Analytical data showing the monthly variations in the composition of water from the Tempe drainage ditch from July, 1921, to December 1922, are presented (E. S. R., 48, p. 487).

Preservative treatment of fence posts (*Iowa Sta. Rpt. 1924, p. 51*).—Studies on the treatment of nondurable fence posts with preservatives, which have been under way for from 17 to 18 years, are said to show conclusively that creosoting is a big factor in cutting down fencing costs in Iowa. Cottonwood, willow, and elm fence posts which were given a good creosote treatment 17 or 18 years ago are still in service, and some of these posts give evidence of lasting for a total period of 25 or more years.

Public Roads, [August, 1925] (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 6, pp. 117-136+[1], figs. 18*).—This number of this periodical contains the status of Federal-aid highway construction as of July 31, 1925, together with the following articles: The Interrelation of Longitudinal Steel and Transverse Cracks in Concrete Roads, by A. T. Goldbeck; A New Test for Consistency of

Concrete Applicable to Dry Paving Mixtures, by F. H. Jackson and G. Werner; Commodity Transportation by Motor Truck, by J. G. McKay; Tar Paper on Loess Subgrade Lessens Hair Cracks in Concrete Pavement, by R. W. Crum; Present Status of the Truck Tire Tests of the Bureau of Public Roads, by E. B. Smith (see below); A Deformation Test for Asphaltic Mixtures, by H. M. Milburn; and Colors and Forms of Traffic Signals.

Present status of the truck tire tests of the Bureau of Public Roads, E. B. Smith (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 6, pp. 129, 130*).—A preliminary report is presented of tests in progress to determine the relative cushioning properties of solid rubber, cushion, and pneumatic truck tires.

It has been found that the magnitude of the deceleration of a truck wheel may be as high as 2,500 ft. per second, as in the case of a badly worn tire. In some cases this may produce an impact force equivalent to 15 times the static load. Wide tires were found to give higher impact forces than narrow tires for the same load. The vertical thickness of rubber available for cushioning in solid and cushion tires was found to be a very important factor, since an ordinary worn tire may deliver an impact blow as great as 7 times the static load of the same tire. It was further found that an unevenly worn or damaged tire may easily produce a force equivalent to that of a very rough road, both in the impact to which the road surface will be subjected and the equal and opposite shocks which will be transmitted to the truck. The cushioning qualities were found to be greater for hot tires than for cold ones, and the variation of cushioning with respect to the temperature was rectilinear.

Alcohol motor fuel from molasses.—I, Use of cane molasses for manufacture of motor fuel, E. C. Freeland (*Indus. and Engin. Chem., 17 (1925), No. 6, pp. 615–621*).—This paper contains a general discussion of the equipment needed, methods of manufacture, yields and cost data of alcohol and alcohol-ether motor fuels from cane molasses, with special reference to their manufacture on sugar plantations. Reasons for the use of alcohol fuels, methods for chemical control, and the research problems of the industry are also considered.

The tractor on Ohio farms, F. L. Morison (*Ohio Sta. Mo. Bul., 10 (1925), No. 5–6, pp. 73–77*).—The results of a tractor survey on 100 farms in northwestern and northeastern Ohio, made during the 5-year period from March, 1918, to March, 1923, are briefly presented and discussed.

Press work in agricultural machinery plants, C. C. Hermann (*Machinery, 31 (1925), No. 12, pp. 938–940, figs. 3*).—This is the first of a series of articles describing the dies used in drawing and forming the parts for agricultural machinery.

Dynamometer tests at Potchefstroom, W. S. H. Cleghorne (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 3, pp. 224–226, fig. 1*).—Data from dynamometer tests of plowing are briefly summarized, resulting in the development of a new method of yoking oxen, which it is thought will result in making the 3-furrow plow a practical implement.

The furrow drill for sowing winter wheat in central Montana, R. W. May and C. McKee (*Montana Sta. Bul. 177 (1925), pp. 24, figs. 16*).—Experiments conducted in cooperation with the U. S. D. A. Bureau of Plant Industry are reported, which showed that in comparison with the ordinary drill the furrow drill, which plants wheat in furrows, causes a material reduction of winterkilling and reduces injury due to the drifting of soil. The furrows and ridges made by the furrow drill were found to be quite effective in reducing soil blowing.

Wheat sown in furrows was found to receive more benefit from either light or heavy snows than that sown with an ordinary drill. Light snows drifted into the furrows and filled them to the top of the ridges, thereby protecting the plants, while wheat sown with an ordinary drill was frequently left entirely exposed to weather conditions following light snows.

There was less winter injury, due to alternate freezing and thawing, of wheat sown in furrows than of wheat seeded under the ordinary method. Most of the cracks under the furrow method of seeding occurred along the ridges, while under the ordinary method of seeding they occurred promiscuously throughout the drilled area and killed or injured much of the wheat. Winter wheat sown with a furrow drill was found to have a tendency to emerge earlier than wheat sown with an ordinary drill, due to the more favorable moisture conditions prevailing in the deeper furrow. The winter wheat sown with a furrow drill also produced greater yields than that sown with an ordinary drill, due to less winterkilling.

It was found that there is a slight disadvantage in sowing spring wheat with a furrow drill as compared to sowing with the ordinary drill, since the ridges made by the furrow drill interfered more at harvest time. Straw mulching did not consistently decrease or increase the stands in spring or the yields obtained from using either drill during the 4-year period 1920–1923. On the whole, the straw mulch appeared to injure the spring stands slightly and reduce the yields obtained from spring wheat sown with the furrow drill, while slightly better stands and yields were obtained from that sown with the ordinary drill. Suggestions for using the furrow drill are included.

Field experiments with harrows [trans. title], N. P. Sokolov (*Izv. Opytn. Dona i Sev. Kavkaza* (*Jour. Agr. Research Don and North Caucasus*), *No. 6* (*1924*), *pp. 30–84, 341–343, pls. 2, figs. 28*).—Comparative tests of five different harrows are reported. The weight of the harrow and the inclination of and pressure on the teeth were found to be important factors in smoothing efficiency. A large amount of comparative data is presented and discussed.

Tillage and weeds, F. C. Gates and M. C. Sewell (*Ecology, 6* (*1925*), *No. 2, pp. 138–142, pl. 1*).—Studies conducted at the Kansas State Agricultural College are reported which showed that under Kansas winter wheat field conditions early tillage treatment, especially plowing, whether followed by later treatment or not, favors the development of weeds such as smartweed rather than grasses such as crab grass during the fallow period. No treatments or late treatments, on the other hand, were found to favor the extensive development of crab grass at the expense of weeds of the smartweed type.

Dairy engineering, J. T. Bowen (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1925, pp. XIV+532, figs. 163*).—This volume, one of the Wiley Agricultural Series and edited by J. B. Davidson, is intended primarily to aid those engaged in the production and handling of milk and in the manufacture of milk products, and in the selection, installation, operation, care, and management of the necessary machinery. It contains chapters on definitions and units, steam and steam boilers, boiler settings, boiler fittings and accessories, chimneys, combustion—firing, the steam engine, steam piping and accessories, exhaust steam and its uses, sources of heat loss in small steam plants, the internal-combustion engine, transmission of power, the compression refrigerating system, methods of utilizing refrigeration, insulation, direct-current motors, alternating-current motors, and temperature measurements and control.

Poultry houses, G. P. Goodearl (*Montana Sta. Circ. 129* (*1925*), *pp. 8, figs. 6*).—Practical information on the planning and construction of poultry

houses adapted to Montana conditions is given, together with working drawings and bills of material.

Why ventilate farm barns and how, F. E. FOGLE (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 20–26, figs. 4*).—A discussion is presented of the fundamental rules to be considered in the planning and installation of ventilating systems for farm barns, based on experimental work at the station.

The home refrigerator, E. H. PARFITT (*Indiana Sta. Circ. 124 (1925), pp. 12, figs. 5*).—Experiments on the operation and efficiency of small ice refrigerators are reported.

The results showed that bacterial multiplication in foods in refrigerators varies directly with the refrigerator temperature, and that the temperature varies in different parts of the refrigerator, being coldest in the lowest part of the ice chamber and warmest above the ice chamber. The cold air circulates downward, then upward. The temperature was found to be lowest on the shelf directly below the ice chamber and warmest on the top shelf in a refrigerator receiving ice from the side. The temperature of the different shelves in the food compartment of a refrigerator receiving ice from the top varied very little, and there was less variation in temperature in the food chamber of top-icing refrigerators than in that of refrigerators icing from the side.

The window box was found to be a fair substitute for a refrigerator with reference to temperature during periods when the outside weather conditions vary from a maximum of 60° F. to a minimum of 31°.

The amount of ice in the ice chamber of a refrigerator was found to vary indirectly with the refrigerator temperature. The greatest increase in temperature occurred when the ice chamber contained less than one-third the rated capacity of ice.

Covering the ice with newspaper increased the temperature within the refrigerator, and the saving in ice was not sufficient to warrant this increase in temperature. Covering with newspaper also caused a high absorption of volatile odors.

Tests on household septic tanks, H. W. CLARK (*Engin. and Contract., Water Works, 63 (1925), No. 6, p. 1250*).—Analytical data from tests of two household septic tanks are presented and discussed with reference to their design.

RURAL ECONOMICS AND SOCIOLOGY

The principles of agriculture, J. R. AINSWORTH-DAVIS (*London: Methuen & Co., Ltd., 1924, pp. XIV+261, pl. 1, figs. 98*).—This aims to set forth the chief facts and scientific principles on which successful agricultural practice depends.

Fundamental basis of a State agricultural program, G. W. FORSTER (*Jour. Farm Econ., 7 (1925), No. 1, pp. 52–62*).—The basis upon which any State or regional program must rest is an understanding of the physical, economic, and social forces at work. Economic facts must be assembled by natural or geographic divisions. The situation must be canvassed for the purpose of determining the capital possessions of the region in the form of implements, machinery, buildings, livestock, and miscellaneous capital goods involved in production. The labor supply must be determined, as well as the character and entrepreneural ability of the farmer. Besides these factors of production, the history of the region, the geographic distribution of production, and the various markets to which products are likely to be sent must be surveyed.

After a program is determined upon, the establishment of an agency whose duty it will be to insure that the program may be modified as conditions demand is necessary. The discussion of this paper by A. J. Dadisman is largely a presentation of the West Virginia State agricultural program.

Farming business in the Gallatin Valley, H. E. SELBY (*Montana Sta. Bul. 175 (1925), pp. 30, figs. 11*).—The results of a study of irrigation farming in Montana in 1913 and 1918 to 1922 are presented here. The report is based upon 70 records for 1918, 80 for 1919, 77 for 1920, 57 for 1921, and 80 for 1922. Preliminary notes upon much of this material have been abstracted previously (E. S. R., 37, p. 290; 49, p. 188).

The average labor income was $555 in 1913, $1,501 in 1918, minus $731 in 1919, minus $2,098 in 1920, minus $1,268 in 1921, and minus $96 in 1922. In every year the labor incomes covered a wide range, both above and below the average, and the comparative profitableness of individual farms from year to year was very inconsistent. These extreme variations are attributed to unusual variations in crop yields, crop prices, and production costs. The outstanding changes in type of farming during the period under consideration were an increase in dairying, increased production of wheat and hay, and the development of the canning pea industry in the last few years of the period. The differences between the average profits of crop farms, livestock farms, and mixed farms for the entire period were small, although there were considerable differences between them in single years.

The economics of milk production [trans. title], L. VON PRACK (*Kisérlet. Közlem., 26 (1923), No. 1–4, pp. 59–86, figs. 3*).—The milk industry is found to have its principal development in the trans-Danube region of present-day Hungary and in the proximity of the principal cities. Furthermore, the more important milk-producing industries are on the larger medium and the large farms. It is concluded from this study that the most economical herd consists of between 80 and 120 cows, and herds of over 50 or 60 cows are preferred to any smaller number. The dairy farms studied were found to follow crop rotation systems, to have abolished the practice of fallowing, and, in general, to be using the most progressive methods.

The cost of wintering cattle for the production of farmyard manure, E. P. WELLER (*Jour. Min. Agr. [Gt. Brit.], 31 (1925), No. 12, pp. 1103–1113*).—Accounts from a mixed farm of about 4,000 acres in the southern part of England are reviewed, covering the costs of the winter of 1922–23.

The cost of putting S. C. Rhode Island Reds into laying, B. F. KAUPP (*North Carolina Sta. Rpt. 1924, p. 66*).—Of a test flock including 282 baby chicks, 87 per cent were raised. The pullets laid eggs between the twentieth and thirtieth weeks, which were sold locally for $52.60. Ninety-eight cockerels were sold for $91.35. The total cost of raising and feeding to 30 weeks of age amounted to $197.25, which had been paid by the birds with the exception of $31.30.

Farm ownership and tenancy, L. C. GRAY (*Acad. Polit. Sci. New York, Proc., 11 (1925), No. 3, pp. 15–24*).—Farm property ownership in the United States is regarded as reasonably democratic, except possibly in the South, and even there it is becoming more so. Some of the forces that have developed and maintained this democratic system are said to be passing however; that is, it seems very probable that some of our rapidly increasing surplus capital will be forced to seek investment in farm real estate, necessitating large scale holdings. Agriculture is being rapidly commercialized. Inheritance plays a much smaller part in the transfer of farm ownership from one generation to

the next than it did a century ago, and ownership is achieved largely by purchase. Certain characteristics of agricultural competition further complicate the problem of farm tenure.

Jackson's Agricultural Holdings, being the Agricultural Holdings Act, 1923, and the Allotments Act, 1922, . . . together with a manual on tenant-right valuation, W. H. Aggs (*London: Sweet & Maxwell, Ltd., 1924, 6. ed., pp. XIV+392*).—This is a later edition of a volume previously noted (E. S. R., 45, p. 895).

A new method of tenancy disputes adjustment in Japan (*Internatl. Labor Off. [Geneva], Internatl. Labor Rev., 11 (1925), No. 3, pp. 381–388*).—The Conciliation of Tenancy Disputes Act of 1924 aims to provide a rapid and simple procedure for adjusting disputes between landowners and tenant farmers before a local court, an arbitration committee, or one or more arbitrators, with careful provision in each case for a thorough and impartial inquiry into the facts.

The burden of fixed charges on farm lands, H. H. Preston (*Amer. Bankers Assoc. Jour., 17 (1925), No. 10, pp. 607, 608, 644, 645; also in Econ. World, n. ser., 29 (1925), No. 18, pp. 616–619*).—Mortgage credit is deemed essential to the best utilization of farm land. The author reviews the laws, particularly in North Dakota and Washington, regulating farm mortgage investments and limiting the amount loaned on the value of land and recognizing the principle that fixed charges can be met only out of farm income. The importance of further study of statistical measurements of the relation of land income to land value is urged.

An economic study of the marketing of New York potatoes, M. P. Rasmussen (*New York Cornell Sta. Bul. 440 (1925), pp. 177, figs. 53*).—Detailed records were secured from private potato marketing agencies and farmers' cooperative organizations at country points in western and northern New York, data being obtained on approximately 41 per cent of the up-State potatoes shipped in carload lots during the 1921–22 season and on approximately 38 per cent of those shipped during the 1922–23 season. An account is presented of general considerations, such as the services rendered at country shipping points, grades, sacking as compared with bulk shipping, storage, potato handling equipment, and costs and margins. The records of farmers' cooperative associations, single-station dealers, and many-station dealers are then analyzed for each of the two seasons. Other data presented are statistics of the weekly volume of shipments and prices and costs by operations and with comparisons for all the shipping agencies concerned.

It is held that the three types of agencies supplement one another and furnish the competition that encourages the best effort for efficiency and economy. The lack of proper accounting is one of the weak features of the potato shipping business.

The appendix gives tabulated data on carload shipments of New York potatoes and a copy of the working schedules used in the survey.

Crops and Markets, [August, 1925] (*U. S. Dept. Agr., Crops and Markets, 4 (1925), Nos. 5, pp. 65–80; 6, pp. 81–96; 7, pp. 97–112; 8, pp. 113–128; 9, pp. 129–144*).—The usual current notes on market conditions and tabulated market supply and price data are given in these numbers for the important classes of agricultural commodities. Brief notes are offered with respect to foreign crops and markets.

Monthly Supplement to Crops and Markets, [August, 1925] (*U. S. Dept. Agr., Crops and Markets, 2 (1925), Sup. 8, pp. 241–280, figs. 3*).—Cotton condi-

tion reports for July 16 and August 1 and a tobacco condition report for August 1, the results of the June, 1925, sheep survey, and the condition of bees and honey prospects are presented in this issue, together with the usual tabulations of estimated crop conditions and prices of farm products, the statistical report of the livestock and meat situation, shipments of fruits and vegetables, and other items. A review of the 1924 hay crop marketed, estimates of changes of farm population during 1924 based on a survey of 25,000 representative farms in the United States, and a brief analysis of the price situation on July 15 are also included.

Foreign outposts of the Bureau of Agricultural Economics, H. C. Taylor (*Jour. Farm Econ., 7 (1925), No. 1, pp. 63–66*).—This is a brief summary of the methods used in gathering statistical information with regard to agricultural conditions and market demand in foreign countries and facilitating certain lines of selling in foreign markets.

Farmers' co-operative concerns in Michigan, W. O. Hedrick (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 41–43*).—A brief note summarizes the history of and characterizes the cooperative movement in Michigan.

The platform of organized agriculture, G. A. Fox (*Jour. Farm Econ., 7 (1925), No. 1, pp. 22–30*).—The underlying purpose of organized agriculture is to improve the farmer's economic position and his standard of living. Its activities must be limited strictly to the welfare of the farm group and be largely economic in character. The first step in the formulation of a program must be a survey of problems and needs, essential and important among which are those associated with economic business operation. Stabilizing prices and maintaining an American price level for the principal farm commodities which enter the wholesale market are deemed very important considerations. In this connection cooperative marketing is held to have important advantages. Discussion of the paper is contributed by B. H. Hibbard.

The agricultural situation, G. F. Warren and F. A. Pearson (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1924, pp. XVI+306, figs. 106*).—There are here presented certain fundamental basic data, principally in the way of statistics collected in the Bureau of Agricultural Economics, U. S. D. A., which are thought to contribute to an understanding of changes in the price relations of farm products and to furnish a key to probable future relationships. The chapters deal with the agricultural situation, relation of the financial policy to the agricultural situation, other causes of the agricultural depression, effects of deflation on agriculture and industry, taxes, debts, freight rates, prices of farm products in the United States, farm, wholesale, and retail prices, prices paid to farmers in different States, wheat, cotton, potatoes, corn and hogs, dairy products, beef cattle, sheep and wool, poultry and eggs, horses, other farm products, farm wages, value of land, erroneous measures of farm conditions, other agricultural depressions, probable future prices, effects of the agricultural depression, adjusting farm to deflation, and remedies.

Did deflation ruin the farmer and would inflation save him? G. W. Dowrie (*Jour. Farm Econ., 7 (1925), No. 1, pp. 67–83*).—The point of view is taken that the banking system of the country is to be blamed rather for tardiness in reducing the discount rate in 1919 than for deflating the farmer in 1920. Consideration is given to foreign parallel or contemporary situations and the world-wide break in prices in 1920. Certain evils of reinflation as a remedy are recited. The discussion by F. L. Garlock consists of a summary of findings from a study of Iowa banks from 1914 to 1924. The power

of the Federal reserve system to effect price stabilization is questioned in view of the fact that neither it nor any independent bank has any appreciable control over the activity of deposits, which is a matter into which come many psychological elements.

Annual report of the [Norwegian] Agricultural Prices Central, 1924 [trans. title], O. SENDSTAD (*Landbr. Priscent. [Norway] Aarsberet., 5 (1924), pp. 24*).—This body having considered the fluctuation in the cost of living expressed in terms of what is known as a "natural unit," which stands for the average proportion in which certain important articles of food are consumed, finds that the fluctuation of prices throughout the year was rising in all European towns and countries mentioned, while in New York it was somewhat unsteady with lower prices in December than in January. The rise was proportionately greatest in Oslo and smallest in London.

The Price Current-Grain Reporter year book for 1924 (*Chicago: Price Current-Grain Rptr., 1924, pp. 112*).—Statistics for the year ended May 1 are presented, continuing the series previously noted (E. S. R., 51, p. 597).

Some economic factors in an American agricultural policy, E. G. NOURSE (*Jour. Farm Econ., 7 (1925), No. 1, pp. 1–21*).—In the presidential address delivered before the fifteenth annual meeting of the American Farm Economic Association, December 29, 1924, a number of topics are briefly presented, including mercantilist policies of earlier years, the cheap-labor policy as applied to agriculture, economic internationalism v. self-sufficiency, and ordered development and safeguarded progress. As to the last of these, the question is raised as to whether it is not desirable that we should consolidate the agricultural positions already taken, completing and improving our railway and highway systems, supplying better educational facilities, securing better homes, and developing better organization of production, distribution, and finance, without attempting to extend the pioneer frontier and pioneer methods any farther into western Canada. It is held that an agricultural policy should check extreme development of particular interests, avoid maladjustments between groups and sections, and consider the whole process of consumption, production, market distribution, capital formation, and entrepreneurship rather than any particular step in the process separately or any special interest concerned in a single step of the process. The task of research and education must be to point out such institutional adjustments as are needed and to assist the farmer in making them.

Developments in the wheat situation, January to March, 1925, J. S. DAVIS, K. SNODGRASS, and A. E. TAYLOR (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 5, pp. 145–171, figs. 4*).—Exceptionally heavy speculative activity is found to have accompanied and to have been largely responsible for the changes in wheat prices during the period under consideration. Basic facts of supply and demand for the crop year have changed only slightly. Exports have been exceptionally heavy, as have also European imports. Visible supplies have been maintained at high levels, although the stocks behind them are unusually low. It is thought that the surpluses available for export will cover the import requirements for the rest of the year with a small but adequate margin. The outlook for new crops is held to be fairly promising.

Crop yields on large estates in Hungary, 1911–1920 [trans. title], R. KÁROLY (*Kísérlet. Közlem., 27 (1924), No. 1–2, pp. 63–73*).—An investigation is reported upon in which questionnaires were returned representing 110 large farms in Hungary, 75 of them west of the River Don, 16 between the Don and

the Tisza, and 14 east of the Tisza. In general crop yields on these estates surpass the average by about 50 per cent, and the decrease in yields in the years 1916 to 1920 was markedly less than the average. The highest yields are shown by years and periods of years.

A description of Connecticut agriculture, I. G. Davis and C. I. Hendrickson (*Connecticut Storrs Sta. Bul. 127 (1925), pp. 45–207, figs. 58*).—This bulletin furnishes a brief summary of the history of Connecticut agriculture and a description of the agriculture of the State as a whole and by towns from the point of view of types of farming, the size and value of farms, the use of land, the nationality and age of the farmer, and the livestock and crop enterprises of the State. Maps, graphs, and tables based upon the 1920 census constitute the greater part of the publication.

Fairfield County: Economic and social, S. W. Nicholson, A. M. Faucette, and R. W. Baxter (*S. C. Univ. Bul. 142 (1924), pp. 83*).—The nine chapters of this report consist of as many signed articles covering economic and social conditions of this county of South Carolina.

Agricultural development in Palestine, E. Mead (*London and New York: Zionist Organization [1924], pp. 31*).—The questionnaires prepared by officials connected with the Zionist movement are shown, together with the author's replies after having made a study of the region to determine upon the colonization methods and policies which he would advise. Those settlements which have been established are described briefly.

Cost of living [studies at Iowa Station] (*Iowa Sta. Rpt. 1924, p. 52*).—A preliminary report of investigations is said to show that for the year ended July 1, 1923, the cost of living of an Iowa farm-owning family was $1,875.90, and that of a tenant family $1,506.40, charging everything furnished by the farm at what the farmer would realize if it were sold. The families owning farms realized approximately 40 per cent of their total cost of living directly from the farm and tenant families slightly over 42 per cent.

A social survey of a "Mormon" farm village, L. Nelson (*Rural Amer., 3 (1925), No. 6, pp. 8, 9*).—A brief preliminary summary is given of facts ascertained in a survey of Escalante, Utah, collected cooperatively by Brigham Young University and the U. S. Department of Agriculture.

Insanity among farmers' wives, C. E. Thorne (*Ohio Sta. Mo. Bul., 10 (1925), No. 5–6, pp. 91–93*).—Extracts from the statements of superintendents of State hospitals for the insane in Ohio to a request for information on this subject are cited, together with data from other sources, all of which tend to refute the popular argument that farmers' wives are more subject to insanity than women in other vocations because of the alleged monotony of their lives.

The farmer's church, W. H. Wilson (*New York and London: Century Co., 1925, pp. [5]+264*).—A discussion of certain aspects of the decay of old religious forces in rural communities is followed by chapters commenting upon the peculiar manifestations of a rural psychology, and the book is concluded with a few chapters discussing church finances and extension.

The farm zone, R. R. Kern (In *The Supercity. Washington, D. C.: Author, 1924, pp. 116–156*).—One chapter out of a description of an ideal planned city is devoted to the production and marketing of vegetable and other foods in the region surrounding the city, which would provide a large part of the food of the city dwellers.

The suburban trend, H. P. Douglass (*New York and London: Century Co., 1925, pp. XII+340, figs. 25*).—The suburbs of American cities are described and analyzed. Their present extent and growth, how they vary and why, costs

of suburban living, the psychology of suburban dwellers, and special aspects of social life and organization are discussed.

The author has concluded that the suburbs are, in the main, intermediate in form rather than in significance. Essentially, they are parts of the evolving cities and in sharp contrast with the original rural pattern of social experience. Nevertheless, the study is said to have discovered a widening geographical zone around cities and definitely within the sphere of urban influence, which is devoted to the production of food from the soil and is dominated by a type of life unmistakably rural in its major quality. Quantitative measurements of the suburban trend were attempted wherever possible.

Kelsey's rural guide, D. S. KELSEY (*Boston: Atlantic Mo. Press, 1925, pp. XX+299*).—Suggestions covering general aspects of suburban or rural living, farming and gardening procedure, business phases of farming, and social problems in the country are put forth in numerous short chapters.

MISCELLANEOUS

A classified list of projects carried on by the agricultural experiment stations, 1924–25, E. R. FLINT (*U. S. Dept. Agr., Off. Expt. Stas., 1925, pp. 2+XIV+404*).—This revision, in mimeographed form, of the list previously noted (E. S. R., 49, p. 898) is referred to editorially (E. S. R., 53, p. 303).

Thirty-third Annual Report [of Arizona Station, 1922], J. J. THORNBER ET AL. (*Arizona Sta. Rpt. 1922, pp. 171–250, figs. 13*).—This contains the organization list, an administrative report on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1922, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Report [of Iowa Station, 1924], C. F. CURTISS and W. H. STEVENSON (*Iowa Sta. Rpt. 1924, pp. 64*).—This contains a report on the work of the station, including a financial statement for the fiscal year ended June 30, 1924. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Forty-seventh Annual Report of the North Carolina Agricultural Experiment Station, [1924], B. W. KILGORE ET AL. (*North Carolina Sta. Rpt. 1924, pp. 95, figs. 15*).—This contains the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1924. The experimental work is for the most part abstracted elsewhere in this issue.

The Quarterly Bulletin [of the Michigan Station], edited by R. S. SHAW and E. B. HILL (*Michigan Sta. Quart. Bul., 8 (1925), No. 1, pp. 54, figs. 14*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Frank Azor Spragg, by H. M. Brown; The Michigan Legislature Adopts Standard Grades for Potatoes, by J. W. Weston; Hastening Beet Breeding Operations, by E. E. Down and C. A. Lavis; Adsorption and Soil Acidity, by E. J. Miller; The Status of Agricultural Cooperation in the United States, by W. O. Hedrick; Making Good Apple Cider, by F. W. Fabian; and A Recent Hygienic Survey of Dairy Practices on General Farms, by D. B. Shutt.

Monthly Bulletin of the Ohio Agricultural Experiment Station, [May–June, 1925] (*Ohio Sta. Mo. Bul., 10 (1925), No. 5–6, pp. 65–96, figs. 4*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Forest Fires Denude 15,000 Acres, by B. E. Leete; The Oriental Peach Moth, by H. A. Gossard; Dairy Cows Need Grain with Pasture, by A. E. Perkins; and Intestinal Coccidiosis in Fowls, by B. H. Edgington.

NOTES

Arizona University and Station.—The station has completed the construction of a barn costing $3,000 at the Salt River Valley Experiment Farm, this replacing the one which was burned last spring.

Owing to the large amount of pumping in the Salt River Valley to supplement the supply from Roosevelt Dam, the water level in the valley has dropped in some instances as much as 30 or 40 ft. To insure a permanent supply of water at the Salt River Valley Experiment Farm, the station has drilled a 16-in. well 150 ft. deep and installed a pump. A steel water storage tank with a capacity of 30,000 gal. is also being erected for fire protection as well as for domestic purposes.

Clifford N. Catlin, associate professor of agricultural chemistry in the university and associate agricultural chemist in the station, died November 12 at the age of 45 years. Professor Catlin was a native of Nebraska, graduating from that university in 1903 and receiving the M. A. degree in 1912. In the latter year he entered upon his work in Arizona. He had given special attention to studies of alkali reclamation.

California Station.—In addition to the sum provided for maintenance of the work of the division of poultry husbandry, $40,000 has just been made available for the construction and equipment of the necessary buildings at the Davis branch and in Berkeley to place the work on a productive basis. Of this amount, $10,000 is to be expeuded at Davis and $30,000 in Berkeley. The fundamental research work of the division is to be transferred to Berkeley because of the more favorable climatic conditions existing there.

Kansas College and Station.—A new $250,000 library building for which a contract was let this month will provide increased facilities for the station library.

Michigan College.—The total student enrollment comprises 1,661 men and 653 women, as compared with 1,491 men and 544 women in the previous year, a total increase of 18.7 per cent. The freshman class of 646 men and 252 women is the largest in the history of the college. This is mainly because of the new courses in liberal arts, but it is deemed significant that the enrollment in agricultural engineering and home economics has not been diminished thereby, as many had expected.

Pennsylvania College.—*Science* notes that C. R. Orton, on leave of absence, is to devote one-half of his time during the coming year to fundamental studies of seed-borne parasites. These studies will be uuder the auspices of the Bayer Company, Inc., and the Crop Protection Institute, and will be carrid on at the Boyce Thompson Institute for Plant Research, under the direction of a special committee consisting of Director William Crocker of the institute, M. T. Munn of the New York State Station, and W. L. Burlison of the Illinois University and Station.

Utah Station.—Charles J. Sorenson has been appointed assistant entomologist and will devote full time to research under the project on chalcis fly in alfalfa-seed.

The first Utah intermountain egg-laying contest, conducted by the station, closed October 31 with some unusually high average records. Birds were in competition from Washington, Oregon, Utah, Idaho, and California. The second contest, with many more contestants, began November 1.

Association of Land-Grant Colleges.—In addition to the general officers listed on page 706, the following sectional officers were elected at the Chicago meeting: Agriculture, J. H. Skinner of Indiana, chairman; B. Youngblood of Texas, vice chairman; and M. S. McDowell of Pennsylvania, secretary; engineering, O. M. Leland of Minnesota, chairman, and R. A. Seaton of Kansas, secretary; and home economics, Margaret M. Justin of Kansas, chairman, and Wylle B. McNeal of Minnesota, secretary. In the three subdivisions of the section on agriculture, R. L. Watts of Pennsylvania and C. A. Willson of Tennessee were chosen chairman and secretary, respectively, for that of resident teaching; D. T. Gray of Arkansas and W. L. Slate, jr., of Connecticut for experiment station work (with E. W. Allen as recording secretary); and I. O. Schaub of North Carolina and J. D. Willard of Massachusetts for extension work.

In the standing committees, C. Everett Myers of Pennsylvania, Ava B. Milam of Oregon, and H. S. Boardman of Maine succeeded for three-year terms G. A. Works of New York, Anna E. Richardson of Iowa, and R. A. Seaton of Kansas on the committee on instruction in agriculture, home economics, and mechanic arts. In the committee on college organization and policy, Ruth A. Wardall of Illinois succeeded Martha Van Rensselaer of New York, and a vacancy was filled by the appointment of C. W. Pugsley of South Dakota. J. C. Kendall of New Hampshire and W. R. Dodson of Louisiana were appointed to the committee on experiment station organization and policy, J. R. Hutcheson of Virginia and P. V. Maris of Oregon to that on extension organization and policy, and A. M. Soule of Georgia and T. O. Walton of Texas to that on military organization and policy, succeeding, respectively, R. W. Thatcher of New York and F. D. Farrell of Kansas, G. I. Christie of Indiana and T. O. Walton of Texas, and E. G. Peterson of Utah and H. A. Morgan of Tennessee. E. A. Hitchcock of Ohio replaced M. S. Ketchum of Illinois on the committee on engineering experiment stations.

For the joint committees, H. L. Russell of Wisconsin was succeeded on that for projects and correlation of research by H. G. Knight of West Virginia, and J. G. Lipman of New Jersey was succeeded on that dealing with publication of research by R. W. Thatcher of New York.

Necrology.—Dr. N. Hjalmar Nilsson, for 35 years head of the Swedish Seed Association and director of the experiment station of that association at Svalöf, died April 15, 1925, at the age of 69 years.

Dr. Nilsson pursued his undergraduate work at the University of Lund and received the doctorate from the same institution. Shortly after completing his university work he became connected with the Swedish Seed Association and two years later entered upon his long period of service as director of its activities. He was largely responsible for the notable progress in the development of the experiment station at Svalöf and the organization of its work, especially the improvement of field crops through plant breeding. Many of the important varieties originated at Svalöf are the work of his own hands.

Prof. Gunnar Schotte, Director of the Swedish State Forest Experiment Station at Stockholm, died August 28 at the age of fifty-one years.

EXPERIMENT STATION RECORD

VOL. 53 DECEMBER ABSTRACT NUMBER No. 9

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY

Chemistry in the twentieth century, edited by E. F. ARMSTRONG (*London: Ernest Benn, Ltd., 1924, pp. VIII+11-281, pls. 9, figs. 38*).—As outlined in the introduction by E. F. Armstrong, "the object of this volume is to put on record our knowledge of chemical and physical science in Britain and the Empire with particular reference to the progress during the last 30 years, a period which has been exceptionally prolific in new ideas. The first few articles indicate in simple language the development of modern theories and give a clear picture of to-day's position and of the directions in which further progress is to be anticipated. The more specialized chapters describe the actual progress, more especially of British investigators in certain selected fields which particularly lend themselves to such treatment. Other sections again deal with the more practical aspects of the subject and illustrate almost with kaleidoscopic rapidity the progress in certain selected industries consequent on the application of the new theories."

Of particular interest are the following papers: The Chemistry of Colloids, by W. Clayton; Catalysis, by T. P. Hilditch; The Fats and Oils, by J. Allan; The Sugars and Carbohydrates, by J. C. Irvine; Cellulose, by C. F. Cross; The Nitrogenous Constituents of the Living Cell, by R. H. A. Plimmer; Biochemistry and Fermentation, by A. Harden; and Chemistry in Agriculture, by J. Russell and H. J. Page.

Fundamentals of chemistry, L. J. BOGERT (*Philadelphia and London: W. B. Saunders Co., 1924, pp. 324, figs. 19*).—The author's aims in preparing this textbook for nurses and other students of applied chemistry are summarized as follows:

"The attempt has been made throughout to emphasize the fundamental laws of chemistry, which apply alike to inorganic and organic compounds, and to present these principles, unobscured by details, in relatively simple language, with suitable explanations and illustrative material. Another departure from the methods usually employed in a brief and elementary textbook of chemistry has been the inclusion of the modern developments in chemical theory (ionic theory, electromagnetic theory of matter, and theories concerning the structure of the atom), which have revolutionized that science in the last few years. Finally, another special feature is the considerable space devoted to the chemistry of the life processes (nutrition and biochemistry), an adequate conception of which is so important to all and is especially essential in the fields of nursing and medicine."

The foundations of colloid chemistry, edited by E. HATSCHEK (*London: Ernest Benn, Ltd., 1925, pp. 173*).—This collection of reprints and translations of early papers having an important bearing on modern theories of colloid chemistry has been published under the auspices of the British Association Committee on Colloid Chemistry and Its General and Industrial Applications. Nine papers dating from 1838 to 1889 are included, among which the following may be mentioned as of particular interest; On the Physiological Utility of the Fats and on a New Theory of Cell Formation, Based on Their Cooperation and Supported by Several New Facts, by Ascherson; On the Properties of Silicic Acid and other Analogous Colloidal Substances, by T. Graham; and On the Nature of Colloids and Their Water Content, by J. M. van Bemmelen.

Evidence of a new amino acid in proteins, R. A. GORTNER and W. F. HOFFMAN (*Jour. Amer. Chem. Soc., 47 (1925), No. 2, pp. 580–584*).—The authors have isolated the protein teozein (a new prolamine obtained from the seeds of *Euchlaena mexicana*) a new amino acid which is precipitated as the phosphotungstate in the Van Slyke method of protein analysis when the solution is cooled to its freezing temperature. Although the amino acid has not been prepared in a pure state, the data thus far obtained indicate an empirical formula of $C_4H_{11}O_3N$.

Wheat and flour studies.—III, The amino nitrogen content of the immature wheat kernel and the effect of freezing, P. F. SHARP (*Cereal Chem., 2 (1925), No. 1, pp. 12–38, figs. 5*).—In this continuation of the wheat and flour studies previously noted (E. S. R., 53, p. 311), determinations were made by the Van Slyke micro method of the amino nitrogen content of a spring wheat, Marquis, and a winter wheat, Kanred. At the time the analyses were made the kernels of the winter wheat were fairly well developed, but those of the spring wheat were in various stages of development. Moisture determinations were also made for the purpose of correlating moisture content and amino nitrogen. This comparison showed that at the beginning and end of kernel development there is no simple relation between the moisture and amino nitrogen, but that in the middle period of development there is a direct relationship between the two.

The nitrogen distribution in the immature wheat kernel was found to be greatly influenced by different methods of storage and drying. The changes in amino nitrogen expressed as protein (amino N×5.7) in a sample of threshed immature wheat kernels subjected to various treatments are summarized as follows: Vacuum dried for 15 hours at 100° C. —4 per cent, held at room temperature in stoppered test tubes 48 and 72 hours —70 and —81 per cent, respectively; dried in vacuo over concentrated sulfuric acid at 40° for 3 hours +2, dried at room temperature over sulfuric acid for 48 hours —43, air-dried at room temperature in front of electric fan for 48 hours —38, and air-dried in laboratory at room temperature —58. These results indicate the importance of the method of drying plant material which is later to be subjected to analysis for nitrogen distribution.

The effect of freezing on the amino nitrogen of the growing kernel was studied on the threshed immature kernel, on heads plucked at various stages of growth, part of which were frozen, and on wheat growing in pots. In the threshed immature kernels subjected to temperatures of from —20 to —28°, the amino acid content in most cases increased steadily instead of decreasing. This was also true of the heads plucked at various stages of growth and of the pot-grown wheat. "Freezing apparently stops that part of the synthetic reaction which involves the changing of the amino compounds into more complex ones and, if anything, produces a tendency in the reverse direc-

tion. This reaction, which is apparently irreversible in the normal kernel, is either stopped by the freezing or changed into a reversible one with a tendency to go in the direction of forming more amino compounds."

The composition of crude gluten, D. B. DILL (*Cereal Chem., 2 (1925), No. 1, pp. 1–11*).—Chemical analyses of three glutens, one from durum flour, one from eastern soft red winter wheat flour, and one a commercial product, are reported, with the following results expressed in percentages of the crude gluten: Protein (N × 5.7) 80.91, 72.67, and 81 per cent, respectively; either extract 4.2, 0.75, and not determined; lipoids by the neutral extraction method not determined, 7.05, and 11.56; ash 2.48, 0.63, and 0.91; and carbohydrates by acid hydrolysis 9.44, 18.82, and 4.93. The first gluten is reported to have a fiber content of 2.02 per cent. Other determinations for the second and third glutens were carbohydrates by the Pflüger glycogen method 17.52 and 3.5 per cent, respectively, total P_2O_5 0.38 and 0.46, phytin-P_2O_5 0.05 and 0.22, inorganic P_2O_5 by difference 0.23 and 0.14, lipoid-P_2O_5 0.1 and 0.1, calculated phosphatide (as distearyl lecithin) 1.13 and 1.13, and lipoids by the acid digestion method 5.01 and 10.76 per cent. These data indicate that gluten from different flours may vary widely in composition.

The percentage of each of the important constituents of flour appearing in the gluten in the case of the second gluten are protein 84.5, lipoids 47.5, ash 15.6, total P_2O_5 20.4, phytin-P_2O_5 13, and lipoid-P_2O_5 26 per cent.

The iso-electric points of gliadin and glutenin, E. L. TAGUE (*Jour. Amer. Chem. Soc., 47 (1925), No. 2, pp. 418–422, fig. 1*).—The isoelectric points of gliadin and glutenin were determined by calculation from their ionization as acids and bases when dissolved in suitable proportions of M/100 solutions of primary and secondary sodium phosphates. The values obtained were pH 6.5 for gliadin and between 6.8 and 7 for glutenin. Nitrogen determinations for both gliadin and glutenin gave results in full agreement with the electrometric method.

The non-volatile acids of the blackberry, E. K. NELSON (*Jour. Amer. Chem. Soc., 47 (1925, No. 2, pp. 568–572*).—An analysis by C. P. Lathrop of fresh blackberries by the Official methods gave the following results: Total solids 16.42 per cent, water-insoluble solids 9.06, total sugars as invert 4.69, alcohol precipitate 0.503, pectic acid 0.311, ash 0.424 per cent, alkalinity number of ash 13.6, acidity 88.0 cc. of N/10 acid per 100 gm., P_2O_5 in ash 37.8 mg. per 100 gm. of sample, and citric acid (pentabromo-acetone method) 0.002 per cent.

Determinations of the nonvolatile acids, as in previous studies on peaches and apricots (E. S. R., 53, p. 105), showed the predominating acid to be optically active isocitric acid, which constitutes about five-sixths of the total acids of the fruit. Moderate amounts of *l*-malic and traces of oxalic, succinic, and citric acids were found.

Effects of the method of desiccation on the carbohydrates of plant tissue, K. P. LINK (*Jour. Amer. Chem. Soc., 47 (1925), No. 2, pp. 470–476. figs. 2*).—This paper deals with the changes taking place in the sugar content of the various tissues used in the investigation of the effect of drying upon the nitrogenous constituents (E. S. R., 53, p. 107).

Drying temperatures below 65° C. changed the sugar content of all the materials tested, the change in most cases being a decrease in free reducing sugars, with no appreciable change in total sugar. Beet and corn leaves were dried at 65 and 80° without appreciable changes in the sugar content. Barberry leaves dried at the same temperatures showed an increase in free reducing sugar through inversion of the sucrose. In corn ears dried at 65°

there was an increase in dextrins caused by hydrolysis of the starch and a decrease in free reducing sugars on account of their synthesis to dextrins. Killing and drying for 24 hours at 98° lowered the sugar content of the beet and corn leaves and corn ears by caramelization and leaching and caused hydrolysis of the sucrose in barberry leaves. The Spoehr method of heating the tissue in a closed vessel for 30 minutes at 98° raised the temperature to the killing point more rapidly than direct heating at the same temperature in an open system.

It is concluded that it is impossible to dry certain tissues without changing their sugar content, and that in such cases the method of preservation with alcohol recommended by Davis, Daish, and Sawyer (E. S. R., 36, p. 125) should be adopted.

The preparation of insulin, D. A. Scott and C. H. Best (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 238–240*).—A brief description is given of the methods at present employed at the Connaught Laboratories, University of Toronto, for the preparation and standardization of insulin. Special attention is called to the apparatus on account of the care that must be taken to avoid direct contact of the insulin solution with metallic substances. The most important new modification of the process, as previously described (E. S. R., 50, p. 712), consists in the separation of fats and lipoid material from the concentrate by filtering at 50° C. and by treatment with 90 per cent alcohol before the fractional precipitation at different acidities. Yields of 1,800 to 2,200 rabbit units of insulin per kilogram of pancreas have been obtained by the present method.

Causes of errors in the analysis of high-grade phosphatic materials, R. J. Caro and E. L. Larison (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 261–264*).—This is a general discussion of the chief sources of error in the analysis of double superphosphates by the standard methods employed in fertilizer laboratories, with the necessary precautions for avoiding these errors.

Free acid in acid phosphate—its determination and value, P. McG. Shuey (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 269, 270*).—A method of determining free phosphoric acid in acid phosphates or mixed fertilizers is described and the value of the determination in the manufacture of acid phosphates and fertilizers is discussed. The method consists essentially in dissolving 2 gm. of the material in 100 cc. of acetone, with frequent shaking in a stoppered flask for 2 hours, diluting 50 cc. of the filtered solution to about 250 cc. with cold, boiled, distilled water, and titrating with carbonate-free N/10 sodium hydroxide to end points with methyl red and phenolphthalein as indicators. The difference between these end points represents one-half of the H_3PO_4, and the percentage H_3PO_4 is calculated by doubling this titration and multiplying by the factor 0.4903.

A knowledge of the content of free phosphoric acid is considered of importance not only as an index of proper and uniform mixing in the manufacture of acid phosphates, but also as an index of the amount of other materials, such as Cyanamid, which can be added without reversion to insoluble.

Determination of mineral and organic ammonia in fertilizers, F. B. Carpenter and H. L. Moxon (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 265, 266*).—Comparative analyses of samples of fertilizers for mineral and organic nitrogen by the magnesium oxide, reduced iron, and zinc-iron Official methods and the Devarda alloy method are reported, with the following conclusions:

To obtain satisfactory results by any of the methods, a connecting bulb of the type of the Davisson scrubber should be used. The zinc-iron method gives

too high results in mixed fertilizers containing organic matter. The reduced iron method, with proper precautions, is more satisfactory than the zinc-iron method. When nitrates are present the Devarda alloy method is the more satisfactory, while in all cases where nitrates are not present the magnesium oxide method should be used.

The determination of dicyanodiamide, C. D. GARBY (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 266–268*).—A description is given of the various steps involved in the development, at the U. S. D. A. Fixed Nitrogen Research laboratory, of a method of determining dicyanodiamide by hydrolyzing it to guanylurea and precipitating the latter compound from a solution of the residue by nickel nitrate in strongly alkaline solution. The technique is described for the application of the method to technical dicyanodiamide, commercial calcium cyanamide, cyanamide-acid phosphate mixtures, and solutions containing dicyanodiamide, guanylurea, and biguanide.

A double-reacting turmeric paper, W. BRINSMAID (*Indus. and Engin. Chem., 17 (1925), No. 3, p. 264*).—A turmeric paper, which turns a pink or cherry color in the presence of boric acid and its salts, followed by a clear blue on the addition of a drop or two of N/10 sodium hydroxide solution, can be prepared by percolating 30 gm. of freshly ground turmeric in a mixture of 180 cc. of 95 per cent alcohol and 120 cc. of water, evaporating the liquid to dryness on a steam bath, adding alcohol in 10-cc. portions, and decanting the clear liquid until all of the red oily mass has dissolved. The clear liquid is filtered and alcohol added to a volume of 100 cc. The test paper is made by saturating 1 gm. of dry paper pulp from filter paper previously washed with hydrochloric and hydrofluoric acids in a solution of 15 drops of the turmeric solution in 75 cc. of water, filtering, and drying.

Preliminary notes on the direct determination of moisture, G. L. BIDWELL and W. F. STERLING (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 147–149, fig. 1; also in Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 3, pp. 295–301, fig. 1*).—In the method described the material is heated with toluene in a flask connected by a bent glass tube with a receiving tube provided with a reflux condenser. A section of the receiving tube consists of a calibrated section of a 5-cc. Mohr pipette. The apparatus is identical in principle with one devised by Dean and Stark for determining water in petroleum emulsions.[1]

A comparison is reported of the results obtained by this method and by the oven method on several food materials. In nearly every case satisfactory agreement was obtained. The advantages and disadvantages of the method are discussed briefly.

A rapid method of determining carbon in organic compounds, H. D. WILDE, JR., and H. L. LOCHTE (*Jour. Amer. Chem. Soc., 47 (1925), No. 2, pp. 440–446, fig. 1*).—The method consists essentially in burning the compound in a calorimetric bomb with oxygen under pressure, absorbing the carbon dioxide by shaking with N/2 barium hydroxide contained in the bomb, and determining the carbonate formed by titration with N/2 hydrochloric acid to phenolphthalein and methyl orange end points. It is stated that nitrogen from nitrogen compounds does not interfere with the carbon determination, but that if halogens are present the values obtained are high owing to the formation of small amounts of oxyhalogen compounds which interfere with the titration for carbonate. In such cases the oxyhalogen compounds formed should be destroyed by some reducing agent such as hydrazine hydrate, the solution acidified and boiled, and the carbon dioxide thus liberated dissolved by barium hydroxide and titrated as usual.

[1] Jour. Indus. and Engin. Chem., 12 (1920), No. 5, pp. 486–490.

The analytical value of the melting point of the insoluble volatile acids from fats, G. VAN B. GILMOUR (*Analyst, 50 (1925), No. 588, pp. 119–126*).—An examination of the value of the Blichfeldt method of estimating coconut and palm kernel fats in butter and margarines (E. S. R., 41, p. 412) is reported, with the conclusion that in mixtures containing only coconut and palm kernel fats the method is accurate for either fat to within 5 per cent of the actual amount present. This is also true for mixtures containing coconut or palm kernel fat or both with other fats if the percentage of the coconut-palm oil group is above 70. If below this amount the method is not sufficiently accurate to determine the coconut and palm kernel fats separately, but is accurate to within approximately 5 per cent for estimating them together.

Observations on the drying of flour, with notes on its hygroscopic properties, E. R. SMITH and L. C. MITCHELL (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 180–183, figs. 6*).—"The experimental work presented in this paper covers (1) the determination of the moisture content of flour when employing the three types of drying ovens in general use, namely, the water-jacketed vacuum oven, the water oven, and the electric oven; (2) the variation that may be obtained in check determinations of the moisture in the same oven; (3) the loss or gain in weight which flour may undergo when samples are exposed to the atmospheric conditions of the laboratory, both before and after drying; and (4) the effect of cooling the dried sample under different conditions before making the final weighing in the determination of moisture."

The results obtained in the first part of the investigation showed that drying in vacuo in loosely covered dishes gives uniformly greater loss in moisture than drying in open dishes in vacuo or in either open or covered dishes at atmospheric pressure. Irregular results were obtained on drying at atmospheric pressure in covered dishes and in the water oven in open dishes. Exposure to atmospheric conditions before and after drying caused losses and gains in weight, depending upon the moisture content of the atmosphere. The ordinary desiccation with anhydrous calcium chloride as the dehydrating agent proved of little value in preventing dried flour from increasing in weight during cooling.

The quantitative determination of moisture in wheat flour, G. C. SPENCER (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 3, pp. 301–311, figs. 7*).—This contribution from the Bureau of Chemistry, U. S. D. A., consists of a comparison of the methods of determining moisture in flour by drying in hydrogen and in a vacuum oven, together with a description of a new standard or umpire method involving the use of a definite partial vacuum and of a more rapid method for routine work.

Drying over hydrogen gave unreliable results with flour, but fairly concordant results with coarser materials such as corn grits or linseed meal. In the vacuum drying tests, the results obtained varied considerably with the varying degrees of vacuum. The vacuum method proposed is considered to represent the ideal conditions for such drying and is as follows: "Weigh accurately about 2 gm. of the sample in a tared, covered dish. Loosen the cover and heat the dish and contents in a vacuum oven to 98–100° C. for 5 hours at a pressure of not more than 25 mm. (1 in.) of mercury. Tighten the cover on the dish and cool for 20 minutes in a desiccator. Weigh and calculate the loss in weight as moisture."

The routine method consists briefly in weighing accurately about 2 gm. of the sample in a tared, covered dish, heating the dish and contents without cover in an air oven at 130° for 1 hour, replacing the cover, and cooling in a desiccator for 20 minutes. The results obtained with this method agreed

closely with those obtained with the proposed vacuum method, and the time required for the determination is 1 hour against 5 for the vacuum method.

Determination of moisture in wheat and flour, Part III, H. SNYDER and B. SULLIVAN (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 331–314*).—In this continuation of the comparison of various methods of determining moisture in wheat and flour (E. S. R., 53, p. 715), a study was made of the Brown-Duvel method as originally described (E. S. R., 18, p. 1122) and with the special double-walled flask devised by Cox (E. S. R., 30, p. 506).

A typical test with the double-walled flask gave a moisture content of 12.9 per cent as compared with 12.5 per cent with the water oven, 14.3 per cent with the vacuum oven (100° C. and 400 mm. Hg), and 14.4 per cent for 1 hour drying in an electric air oven at 135°. Nine tests with the original Brown-Duvel method gave an average of 12.3 per cent moisture as compared with 11.78 per cent by the water oven.

Attention is called to the confusion arising when the Brown-Duvel method is used for testing wheat and the vacuum oven for flour, with no correction to reduce the results to a uniform basis. The double-walled flask test is considered to be too complicated for flour mill control work. "It would seem feasible to determine the moisture as total volatile products by drying flour in a strictly empirical way, heating to a higher temperature than the boiling point of water, as 125 to 135°, for a short period, as one hour, and then applying an established factor for correcting the results to conform to the water-oven basis of the standard Official methods as specified."

Comments on "glycerol as an aid in ashing flour," R. HERTWIG and L. H. BAILEY (*Cereal Chem., 2 (1925), No. 1, pp. 38–41*).—Further details are given for the technique to be employed in the use of glycerol to hasten the ashing of flour (E. S. R., 53, p. 314).

Extraction and estimation of lipoids in cereal products, O. S. RASK and I. K. PHELPS (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 187–189*).—The observation that determinations by the Official method of the ether extracts of finished alimentary pastes gave results considerably lower than the content of ether extract in the raw materials led to the trial with raw cereal products of a method of fat extraction devised by C. R. Smith for determining the fat content of baked cereal products. This method consists essentially in a preliminary treatment of the material with an ammoniacal alcohol solution, followed by three successive extractions with ether and a repetition of the entire process. The combined extracts are evaporated to dryness on a steam bath and the fat extracted from the residue by successive portions of a mixture of equal volumes of ether and low boiling petroleum ether.

The technique of the method is described in detail, and data are reported on the lipoid contents as thus determined of eggs and of egg noodles and other alimentary pastes and of the ether extract of the same. The method yielded results corresponding much more closely to the lipoid content of the original material than the corresponding ether extracts.

Estimation of lipoid phosphorus in cereal products, O. S. RASK and I. K. PHELPS (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 189, 190, fig. 1*).—The lipoid material extracted from eggs and noodles by the method noted above has been found to yield amounts of phosphorus calculated as P_2O_5 by the Juckenack method which are higher and correspond more closely to the theoretical than the results obtained by the same method with the original material.

An application of the Howard method to the detection of spoilage in berry products, G. H. NEEDHAM and C. R. FELLERS (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 3, pp. 312–327, figs. 6*).—In this application of the Howard

method (E. S. R., 38, p. 166) to canned blackberries, blackberry jam and jelly, and strawberry jam, three series of experiments were conducted. In series 1, berries that were 1 day old when purchased were canned, some immediately and some after 2, 3, and 4 days. In series 2, the contents of some of the cans of series 1 were used for the preparation of jams and jelly, and in series 3 the berries were sorted and moldy berries, picked 5 or 6 days previously, were added in definite proportions to the sound berries. In conducting the microscopical counts on the canned products, the pulp, juice, and the entire contents of the can were used. In all cases the microscopic count of the pulp was higher than that of the clear juice. The use of the entire contents of the can for sampling is recommended as most satisfactory.

Data obtained in the first series showed that berries should be canned within 24 hours after picking. Beyond this time spoilage was evident from the high mold and yeast counts. In series 2 the jelly made from the canned blackberries was found to contain only a small amount of mold or of yeast and spores regardless of the condition of the raw product. The mold content of the blackberry and strawberry jam was proportional to the mold in the original material, but the yeast count in the jams was no higher and possibly lower than in the original material. Preliminary experiments to determine the relationship by weight of decayed or moldy berries to the mold count in the combined pulp and juice indicated that with from 5 to 10 per cent of decayed or moldy berries 40 per cent or more of positive mold fields would be present in the combined pulp and juice.

Identification of sources of vanilla extracts, C. B. Gnadinger (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 303, 304*).—A study of the aromatic constituents of Tahiti and Bourbon vanilla beans has shown that the volatile oil of the former consists chiefly of anisyl alcohol, which is also present in vanillons but is not present in the volatile oil of the more costly Bourbon beans. To detect the presence of anisyl alcohol in vanilla extracts, the following method is recommended:

"Measure 50 cc. of the extract into an evaporating dish and evaporate spontaneously before a fan to a volume of about 15 cc. Transfer to a separatory funnel with water, diluting to 50 cc. Extract once with 50 cc. of ether. Wash the ether extract three times with 15-cc. portions of 2 per cent sodium hydroxide solution and once with 15 cc. of water. Evaporate the ether extract before a fan, and as soon as the ether is driven off dissolve the residue in 0.5 cc. of alcohol. Add two to three drops of the alcohol solution to 2 to 3 cc. of concentrated sulfuric acid in a test tube and mix. In the case of Tahiti vanilla extract a deep, permanent red color develops immediately."

This method is said to give negative results with Mexican, South American, Java, and Bourbon vanilla extracts and to be capable of detecting the presence of from 5 to 10 per cent of Tahiti extract or Mexican extract.

The laboratory book of dairy analysis, H. D. Richmond (*London: Charles Griffin & Co., Ltd., 1925, 3. ed., rev., pp. VIII+118, figs. 37*).—This is the third edition of this manual on the analysis of milk, milk products, butter, and cheese, and the application of these analyses to the detection of adulteration and the addition of preservatives.

A comparative study of methods for determining the per cent of fat in dairy products, R. C. Fisher and C. C. Walts (*Connecticut Storrs Sta. Bul. 131 (1925), pp. 297–330*).—Part 1 of this publication reports a comparison of the Babcock, the Fucoma (Gerber), and the Roese-Gottlieb (Mojonnier) methods of determining the fat content of milk and of the same methods together with the Koehler-Funke volumetric modification of the Fucoma (Gerber) method for sweet and sour cream. These various methods and other modifica-

tions are reviewed from the literature, 44 references to which are included in the final bibliography.

Sixteen samples of fresh sweet milk were tested in quadruplicate by each of the three methods. In most cases the Babcock and Gerber methods gave slightly higher results than the Roese-Gottlieb. Averaging the quadruplicate determinations, the variations from the Roese-Gottlieb were ±0.137 per cent for the Babcock and ±0.122 per cent for the Gerber method. The largest single variations were ±0.288 and ±0.203 per cent, respectively. Increasing the time of centrifuging in the Gerber test to 6 and 8 minutes gave an increase in fat content of only 0.05 per cent above that obtained in 4 minutes.

In the cream tests 338 determinations were made on 4 batches of sweet and 4 of sour cream, representing low, medium, and high testing and frozen cream. The average variations in results compared with the Roese-Gottlieb were ±0.25 per cent for the Babcock method for sweet cream and ±0.27 per cent for the sour cream, ±0.25 and ±0.41 per cent, respectively, for the Gerber weight method, and ±0.64 and ±0.91 per cent for the Koehler-Funke volumetric method. Comparing the results in another way, 94 per cent of the sweet and 88 per cent of the sour cream samples checked within 0.5 per cent of the Roese-Gottlieb method by the Babcock method, 90 and 66 per cent, respectively, by the Gerber weight method, and 54 and 52 per cent by the Koehler-Funke method.

The authors conclude that the last-named method can not be relied upon, but that the Babcock and Gerber methods for milk and cream are of about equal accuracy. "As the Babcock method for milk and cream is recognized as an official method and generally used in the United States, there can be no advantage to the industry in introducing another method which is [no] more accurate or practical."

Part 2, which reports a similar study of ice cream, is noted below.

A comparative study of methods for determining the per cent of butterfat in dairy products.—II, Ice cream, R. C. Fisher and C. C. Walts (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 196–205*).—In continuation of the investigation previously noted (E. S. R., 53, p. 315), the Troy-Fucoma method was subjected to further study to determine the influence of length of time of centrifuging and the temperature of the tester and fat column. Duplicate determinations by the Mojonnier method were used as a standard of comparison.

Centrifuging the sample for 4 minutes at constant speed or for 2 minutes twice gave variable results, which were in most cases lower than those obtained with the Mojonnier method. Centrifuging three times for 2 minutes or once for 6 or 7 minutes with constant speed gave results checking closely with the Mojonnier test. Centrifuging for 9 minutes with constant speed gave results from 0.2 to 0.4 per cent higher than the Mojonnier test. Heating the tester was found to aid in eliminating the hazy film at the bottom of the fat column. With the water-bath temperature at from 125 to 130° F. the readings compared more favorably with the Mojonnier test than at a temperature of from 135 to 140°. No better results were obtained with the analytical balance than with the torsion balance.

It is suggested that the Troy-Fucoma method be modified by using 6 cc. instead of 5 cc. of water, heating the centrifuge, centrifuging for not less than 6 nor more than 7 minutes at constant and full speed, and reading the samples directly from the water bath in which they have been kept for 5 minutes at 130°. The results are reported of fat determinations by the modified method on 25 samples of vanilla, 18 of chocolate, and 2 of strawberry-fruit ice cream. All of the samples checked within 0.25 per cent of the results obtained by the Mojonnier test, and 22 of the 45 samples checked within 0.1 per cent.

Determination of free fatty acid in bodied linseed varnishes and oils, L. M. LARSEN and W. J. YOUNG (*Indus. and Engin. Chem., 17 (1925), No. 3, p. 277*).—Neutral ether is suggested as a solvent for heavy-bodied linseed varnishes in the determination of total free fatty acids. Data are reported showing that the end point with ether is as sharp as with other solvents such as alcohol and alcohol benzene.

Studies of the vitamin potency of cod liver oils.—XII, The color reactions of cod liver oil, A. D. HOLMES (*Jour. Amer. Pharm. Assoc., 13 (1924), No. 6, pp. 532–535*).—The U. S. Pharmacopoeia tests for cod liver oils have been applied to crude fish oils of known origin, to 12 samples of Norwegian medicinal cod liver oil, to cold-pressed cod liver oils, and to 16 samples of cod liver oils from the same source after storage under various conditions for 6 months.

Uniform color reactions were not given by the various cod liver oils, and the results with the other oils resembled those obtained with cod liver oils so closely as to make identification doubtful. More uniform results were obtained with the Norwegian oils and still more uniform with the cold-pressed oils. The tests on the oils after storage indicated that light, air, and moisture bring about some change in cod liver oils during a period of 6 months.

"The general conclusion to be drawn from the results seems to be that the color tests are not sufficiently reliable to serve as a means of identifying cod liver oil, but vary according to the conditions under which the liver oils have been manufactured and stored. Even although the data are inadequate, it appears that liver oils carefully prepared from fresh livers from fish other than cod will give tests identical with those of cod liver oil prepared under comparable conditions."

Extraction and clarification of pectinous fruit juices, J. C. BELL and E. H. WIEGAND (*Oregon Sta. Circ. 63 (1925), pp. 4–12, figs. 4*).—Practical directions are given for the preparation of fruits for the extraction of the largest possible amount of pectin in jelly making, and for the extraction of the juice and subsequent clarification and concentration.

In general the various steps of the process consist in parboiling the fruit at a temperature not exceeding 212° F., with the addition of water in very small amounts in the case of berries and to about half the weight of the fruit in the case of fruits high in cellular material as apples and quinces, and with or without the addition of a little citric or tartaric acid; extracting the juice by intermittent pressure in a heavy screw or hydraulic press; and clarifying the hot juice first by filtering through a filter cloth or centrifuging, and second by adding celite to the filtering surface and juice and filtering with the aid of a filter pump, gravity standpipe, or vacuum pump. The clarified juice may be heated to 180° for 20 minutes and transferred to sterilized bottles and sealed or concentrated to any required density in a vacuum pan and run into clean, sterilized containers.

Method for manufacture of levulose, R. F. JACKSON, C. G. SILSBEE, and M. J. PROFFITT (*Sugar [New York], 27 (1925), No. 1, pp. 9–11*).—This is the same paper as that previously noted (E. S. R., 53, p. 613), with a preliminary note by F. Bates on the significance to the sugar industry of the development of methods for manufacturing dextrose and levulose.

Sugar formation in a sulfite digester: Quick-cook process, E. C. SHERRARD and C. F. SUHM (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 194, 195, figs. 3*).—A comparison is reported of the sugar yields in the digestion of white spruce pulp by the quick-cook process with indirect steam and varying excesses of free sulfur dioxide with that obtained using the Mitscherlich process, as previously reported (E. S. R., 48, p. 415).

In the quick-cook process the sugar formation was more rapid and the yields were larger than in the Mitscherlich process. Variations in the quantity of free sulfur dioxide had no appreciable effect upon the quantity of sugars produced. As in the other process, but little sugar was formed until a temperature of at least 100° C. had been reached, but variations in the final temperature ranging from 130 to 150° had but little effect upon the sugar yields.

Effect of some inorganic salts on the polarization of sugar solutions.—Preliminary data, R. J. Brown (*Indus. and Engin. Chem., 17 (1925), No. 1, pp. 39, 40; also in Planter and Sugar Manfr., 74 (1925), No. 15, p. 289*).—The studies of Jackson and Gillis on the effect of inorganic salts upon the polarization of dilute sugar solutions (E. S. R., 45, p. 317) have been repeated, using still more dilute solutions.

Within the limits of analytical error, the same relation was found to hold true, that the effect of the salts is proportional to the amounts of both acid and sugar present. The average values for the constant K for each salt for all concentrations are as follows: NaCl 0.00246, K_2SO_4 0.00199, $Na_2SO_4.10H_2O$ 0.00205, and $Na_2HPO_4.12H_2O$ 0.00305.

Application of enzymes to beet sugar factory control, H. S. Paine and R. T. Balch (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 240–246; also in Planter and Sugar Manfr., 74 (1925), Nos. 12, pp. 228–230; 13, pp. 248–251*).—"An analytical procedure involving the use of the enzymes invertase and melibiase has been adapted to practical use for precise determination of the sugars sucrose and raffinose in the chemical control of beet sugar factories. By comparing the data obtained with those resulting from direct polarization and acid hydrolysis information is gained relative to the polarization and distribution of optically active nonsugar compounds at successive stages of the factory process. The comparison explains in part the frequent decrease in factory operating efficiency toward the end of the campaign and brings to light certain errors in sucrose accounting as now practiced. The data also have a distinct bearing on the matter of 'unaccountable' sucrose losses and the extent to which these are only apparent and are due to errors of polariscopic analysis."

The cause of the low yield of alcohol on fermentation of molasses, D. N. Gupta and E. R. Watson (*Jour. Soc. Chem. Indus., 43 (1924), No. 38, pp. 291T, 292T*).—An investigation of the cause of the low yield of alcohol from Indian ghur by fermentation is reported, with the conclusion that the trouble is caused by the presence in the ghur of a gum which is very resistant to acid hydrolysis and yields no dextrose or levulose on protracted acid hydrolysis. The gum on oxidation gives a good yield of mucic acid, indicating that it is partly of the galactan type.

The cause of the low yield of alcohol in the fermentation of cane molasses, D. N. Gupta and E. R. Watson (*Internatl. Sugar Jour., 26 (1924), No. 311, pp. 591–593*).—A slightly abridged report of the investigation noted above.

Composition of the oleoresin of Douglas fir, H. K. Benson and D. F. McCarthy (*Indus. and Engin. Chem., 17 (1925), No. 2, pp. 193, 194*).—Data are reported on the refractive index, specific gravity, viscosity, and percentage of volatile oils in samples of crude oleoresins of Douglas fir obtained in Oregon and Washington, on the specific gravity, refractive index, and specific rotation of fractions obtained from the Washington sample by fractional distillation, and on the chemical and physical constants of three samples of rosin and of successive fractions obtained in the distillation of rosin oils.

Arsenated petroleum oil as a wood preservative, W. L. TANNER (*Indus. and Engin. Chem., 17 (1925), No. 2, p. 167*).—Arsenated petroleum oil is reported to be an excellent wood preservative and to have the advantage over materials in common use in that it can be applied in open tanks under atmospheric pressure at a cost of less than half that of other successful processes.

The cellulose of jute [trans. title], A. LEHNE and W. SCHEPMANN (*Ztschr. Angew. Chem., 38 (1925), No. 5, pp. 93–98*).—The literature on the chemistry of jute is reviewed, and original data are reported leading to the conclusion that the cellulose of jute is identical with that of cotton.

The average composition of the jute is given as follows: Moisture 11.42, ash 0.73, fat and resin 1.03, water-soluble constituents 3.84, cellulose 69.63, and lignin 18.83 per cent. The yield of furfural was 11.38 per cent of the crude jute dried at 100° C., 8.35 of the crude cellulose, and 2.41 per cent of the pure cellulose. The behavior of purified jute cellulose on hydrolysis was very similar to that of cotton cellulose. The percentage yields of glucose at any given time during the hydrolysis agreed closely. The results obtained on the hydrolysis of crude jute compared with purified jute cellulose indicate that the lignin in the jute is not chemically combined with the cellulose but only mechanically encrusted with it.

Rubber latex: Its properties and the development of its industrial applications, A. VAN ROSSEM (*Jour. Soc. Chem. Indus., 44 (1925), No. 4, pp. 33T–41T, fig. 1.*).—This is a compilation of information on rubber latex, including its microscopical examination, physicochemical and other properties, the coagulation process, industrial applications in the rubber and other industries, and its preservation and concentration. Over 70 literature references are given as footnotes.

METEOROLOGY

Solar variation and forecasting, C. G. ABBOT (*Smithsn. Misc. Collect., 77 (1925), No. 5, pp. 27, figs. 18*).—This, which is one of three papers dealing with the general subject of solar variation and weather forecasting, is a defense of the author's observations as reliable evidence of the variability of solar radiation and their value as a basis for forecasting the weather.

Solar radiation and weather or forecasting weather from observations of the sun, H. H. CLAYTON (*Smithsn. Misc. Collect., 77 (1925), No. 6, pp. 64, figs. 45*).—This paper gives the major results of the author's investigations during the past two years on the weather conditions of North America in their relation to the variation of the sun.

Solar radiation and the weekly weather forecast of the Argentine Meteorological Service, G. HOXMARK (*Smithsn. Misc. Collect., 77 (1925), No. 7, pp. VII+23, figs. 5*).—In this paper is given an account of the use of variations in solar radiation as a basis for the forecasting of the temperature and rainfall of Buenos Aires, Argentina, during the years 1922, 1923, and 1924.

Weather conditions, F. B. HEADLEY, E. W. KNIGHT, and L. E. CLINE (*U. S. Dept. Agr., Dept. Circ. 352 (1925), pp. 6, 7*).—Records are given of observations on temperature, frost-free period, precipitation, evaporation, wind, and cloudiness at the Newlands Experiment Farm, Fallon, Nev., during 1923 and previous years. The mean temperature and the precipitation (4.83 in.) of the year were nearly normal. The frost-free period was short, 102 days (June 13 to September 24).

The climate of the Netherlands Indies, VI, VII [trans. title], C. BRAAK (*K. Magnet. en Met. Observ. Batavia, Verhandel. 8 (1924), pts. 6, pp. III+343–415+159–198, pl. 1, figs. 21; 7, pp. III+417–497+199–248, pls. 3, figs. 10*).—

Continuing contributions to this subject previously noted (E. S. R., 52, p. 508), part 6 deals with humidity, evaporation, dew and fog, and transparency and haziness of the air; part 7 deals with lightning and thunder, hail, and deviations from the normal and abnormal disturbances. It also compares the climate of the Indies with that of other countries, describing briefly the temperature and rainfall conditions best suited to sugar cane, coffee, tea, rubber, rice, tobacco, and cinchona.

Climate and meteorology [of South Africa], C. STEWART ET AL. (*Union So. Africa Off. Yearbook, No. 7 (1924), pp. 42–62, pls. 6, figs. 3*).—The temperature, rainfall, evaporation, wind, and sunshine conditions of South Africa are summarized, with tables, diagrams, and maps, and the characteristic climatic conditions are briefly described.

Relation between weather conditions and yield of cotton in Louisiana, B. B. SMITH (*Jour. Agr. Research* [*U. S.*], *30 (1925), No. 11, pp. 1083–1086, fig. 1*).—Data on the yield per acre of lint cotton in Louisiana from 1900 to 1922 and average rainfall and temperature for June to August, inclusive, are tabulated and analyzed statistically by an extension of methods suggested in an earlier publication (E. S. R., 39, p. 191). A fairly close relationship is established between weather conditions prior to September and the subsequent final yield of cotton. The theoretical considerations upon which this analysis was made are set forth in considerable detail.

Rainfall conditions as handicaps to tropical development, S. S. VISHER (*Geogr. Rev., 15 (1925), No. 3, pp. 457–465*).—On the basis of field work in the West Indies, the Pacific Islands, Australia, and the Far East, and from an extensive study of rainfall statistics, the author shows that, as a rule, there is a high degree of variability and very unfavorable distribution of the rainfall of the Tropics. Moreover, he shows that a large part of the rain falls in heavy showers which are in large part useless or actually harmful. "Thus it appears that the development of many tropical regions is rather seriously handicapped by rainfall conditions, and before these regions can be developed advantageously the rainfall conditions must be well known and adjustments to them wisely worked out."

Phenological observations during 1924 [trans. title], H. Bos (*Landbouwk. Tijdschr.* [*Utrecht*], *37 (1925), No. 441, pp. 193–200*).—Observations at 30 places in the Netherlands on various trees, shrubs, and flowering plants, including some crop plants and domesticated fruits, are recorded.

Meteorological conditions and plant diseases, E. J. BUTLER (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 3 (1925), No. 2, pp. 369–384*).—Reviewing studies of the influence of seasonal variations of weather on the incidence of disease, it is stated that "in few cases has there been a successful attempt to evaluate the influence of the different factors exactly," but that greater success has been achieved in the study of climatic influences.

"Weather and climate depend on the same set of factors, the ordinary meteorological factors of temperature, humidity, light, wind, etc., and if it is desired to understand the relationship between meteorology and disease an attempt must be made to evaluate the influence of each of these factors on the interaction between host and parasite. Probably this influence is capable, in most cases, of exact evaluation, but the data are as yet somewhat scanty. Temperature, humidity, and radiation are the chief factors about which data exist."

Lines along which investigation has been or may be profitably undertaken are indicated. Emphasis is placed upon the importance of "first establishing the temperature and humidity relations of the parasite and host, singly and together, and only then, with the exact information thus gained, seeking the

correlation with meteorological data. . . . Field observations on the seasonal and regional occurrence of diseases have, no doubt, a certain value, but the trend of recent work has been to show that definite conclusions can not safely be drawn from such observations unless they are controlled and elucidated by the more exact methods of laboratory research."

International co-operation in phenological research, J. E. CLARK (*Nature [London], 115 (1925), No. 2895, pp. 602, 603*).—A tentative list is given of 40 or more farm crops and flowering plants which the author thinks might with advantage be made the subject of cooperative international phenological observations. The need and importance of such cooperation is pointed out.

SOILS—FERTILIZERS

Land cover studies as a basis for a more accurate interpretation of the soil survey, M. F. MORGAN (*Jour. Amer. Soc. Agron., 16 (1924), No. 7, pp. 452–458, fig. 1*).—Studies conducted at the Connecticut Experiment Station are reported, from which the conclusion is drawn that since land-cover studies show certain well-defined relationships of soil types to land cover, additional surveys in specially selected areas which show the best development of the important soil types, especially in the older agricultural regions of the East, may be expected to yield valuable contributions to a more accurate interpretation of the soil survey of similar areas of the same type of soil.

Soil survey of Henry County, Tennessee, R. WILDERMUTH ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+77–109, pls. 6, fig 1, map 1*).—This survey, made in cooperation with the Tennessee Geological Survey, deals with the soils of an area of 376,320 acres in the northwest corner of Tennessee. Topographically, it consists in the uplands of smooth, flat to undulating, and gently rolling areas with steep slopes along the valley walls of streams. The stream bottoms are flat and essentially level. The drainage of the uplands is generally well established. The bottoms are all subject to overflow, and the underdrainage in many places is not very good. The second bottom soils are nearly level to undulating, and range in drainage condition from good to poor.

The soils consist of silty material having the characteristics of loess, ranging from about 3 to 8 or 10 ft. in depth, and unconsolidated silts and clays. Including meadow, 16 soil types of 14 series are mapped, of which the Lexington, Memphis, and Collins silt loams cover 39.8, 20.8, and 12.3 per cent of the area, respectively.

Soil survey of Tucker County, West Virginia, S. W. PHILLIPS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1329–1365, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the West Virginia Geological Survey, deals with the soils of an area of 269,440 acres lying in the severely dissected part of the Appalachian Plateau in northeastern West Virginia. The topography is chiefly hilly to mountainous. Most of the area is said to be well drained.

The upland soils have been derived from the underlying rock formations. Including rough stony land and muck, 19 soil types of 10 series are mapped, of which rough stony land and Dekalb stony silt loam cover 37.8 and 25.3 per cent of the area, respectively.

The composition of some Sudan soils, A. F. JOSEPH (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 490–497*).—In a contribution from the Wellcome Tropical Research Laboratories, Khartum, a description is given of five typical soils of the Sudan covering a wide area. Four of these are heavy clays, and

the fifth is a sandy soil. All are alkaline and with one exception low in calcium carbonate. The results of the complete chemical analysis of the conventional fractions are given, and it is suggested that an important characteristic of a clay soil is the chemical composition of the clay fractions.

The feeding power of plants in different soil horizons, C. E. MILLAR (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 150–156, figs. 4*).—Studies conducted at the Michigan Experiment Station are reported.

The comparative growth of oats and inoculated sweet clover on the different horizons of Fox sandy loam and Miami silt loam indicated that different crops may have quite markedly different feeding powers on the various soil horizons, and that plants with root systems of quite diverse characteristics may vary greatly in the amounts of nutrients removed from the various horizons of different soils. The relatively small growth of sweet clover on the brown layer of maximum clay or concentration horizon of the Fox soil is considered to throw some doubt on the conclusion sometimes drawn from field observations that an accumulation of roots in a horizon of this type indicates a supply of available nutrients.

A modified respiration apparatus for plant and soil studies, J. M. GINSBURG (*Soil Sci., 19 (1925), No. 6, pp. 411–415, fig. 1*).—In a contribution from the New Jersey Experiment Stations a modified plant and soil respiration apparatus is described, the purpose of which is to eliminate leakages due to the unequal contraction and expansion with fluctuations in temperature, thus creating openings between the sealing wax and the glass. The apparatus consists of two bell jars of the same kind of glass, 8 in. in diameter and 14 in. deep, connected edge to edge by a heavy rubber band. The lower jar has a closed top and is inserted mouth upward into a pot half filled with sand in order to keep it in place. The upper jar has an open top into which a soft rubber stopper is tightly fitted. Two glass tubes extending through the stopper into the bell jar connect the apparatus, one with an air pump and the other with bottles containing absorbing reagents for carbon dioxide or any other gas to be measured.

Two new soil thermometers, J. C. RUSSEL and E. G. JONES (*Jour. Amer. Soc. Agron., 17 (1925), No. 2, pp. 93–99, figs. 3*).—These thermometers are described and illustrated and their use demonstrated.

The form of mechanical composition curves of soils, clays, and other granular substances, G. W. ROBINSON (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 626–633, figs. 2*).—Studies conducted at the University College of North Wales, Bangor, are reported, in which the mechanical analysis of a number of soils, clays, and other granular materials was carried out and the results set forth in the form of curves showing the relationship between summation percentages and the logarithm of settling velocity.

The curves obtained are smooth, suggesting that all of the necessary information as to the mechanical composition of a material can be obtained by using a relatively small number of experimental points and drawing the appropriate curve. Results obtained on one scale can readily be transferred to another scale by interpolation.

The most common type of curve is a sigmoid. The steepest portion of the curve represents the fraction present in greatest frequency, which is termed by the author the modal fraction. In the case of certain heavy clays the modal fraction appeared to be at the lower end of the curve, while in the case of materials mechanically disintegrated the modal fraction was at the upper limit of particle size.

Composite curves are obtained in certain cases. They may represent mixtures of different materials or soils in the earlier stages of formation from rock.

The lower limit of particle size appears to be represented by $\log v=\bar{7}.0000$ in the case of normal soils and clays, in which v is the settling velocity. In the case of certain finely divided but nonplastic materials the lower limit appears to be in the region of $\bar{5}.0000$. It is suggested that a better picture of the properties of soils would be obtained by taking the limit for clay at this point instead of at $\log v=\bar{4}.0000$.

The use of the logarithm of settling velocity as a measure of particle size is discussed, and it is suggested that the use of negative logarithms might be avoided by using $\log (v\times10^{7})$, for which the symbol *Lv* is proposed.

Colloidal determination in mechanical analysis, R. O. E. Davis (*Jour. Amer. Soc. Agron., 17 (1925), No. 5, pp. 275–279*).—Studies conducted by the U. S. D. A. Bureau of Soils are reported which indicate that the presence of colloid in soil should be expressed in mechanical analysis, but that the separation of the colloid and its determination by weighing are impracticable at present. It is stated that the water absorption method may be employed to determine the colloid indirectly, and that with proper care the colloidal aggregates and film in the sand groups may be dispersed and separated from the sands. After determining the sands and colloid, the silt is obtained by difference.

The effect of the colloidal content upon the physical properties of soils, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 17 (1925), No. 5, pp. 285–294*).—In a contribution from the Michigan Experiment Station a brief general review of data on the subject is presented, indicating that colloids influence more or less or control practically all of the physical properties of soils.

The chemical nature of colloidal clay, R. Bradfield (*Jour. Amer. Soc. Agron., 17 (1925), No. 5, pp. 253–270, figs. 7*).—In a contribution from the Missouri Experiment Station chemical analyses of a series of colloidal clays from Missouri soils found under humid temperate conditions are reported, indicating that they are rather uniform in composition. The contents of aluminum and iron oxides were found to be higher and that of silica lower than those in the coarser fractions of the soils. Practically all of the aluminum and iron oxides in these colloidal clays was soluble in hot concentrated hydrochloric acid.

Comparative studies of some of the physicochemical properties of synthetic mixtures of colloidal alumina, iron, and silica combined in the same proportion as they exist in the natural colloidal clay and the colloidal clay indicate that the two systems are very different. Acidity studies indicated that acid colloidal clays yield titration curves similar to ordinary weak acids. The relationship of concentration of clay to pH value was also similar to that found for ordinary weak acids. Pure silicic acid prepared in the laboratory gave a concentration pH curve of the same type as colloidal clay, but the maximum H-ion concentration was much less. It was difficult to account for the high H-ion concentration of the most acid colloidal clays if silicic acid was their only acid constituent.

The exchange of cations by colloidal clay when treated with electrolytes took place in chemically equivalent quantities if the H ion was considered the same as the other cations. Aluminum was not replaced from clay by neutral salts in appreciable quantities unless the resulting pH value was less than 4.

Flocculation studies indicated that many of the colloidal clays are flocculated most readily in an acid medium, while colloidal silica, alumina, and iron are all flocculated more readily in an alkaline medium. This is taken

to indicate that many colloidal clays at least are composed largely of complex alumino-silicates rather than of a mixture of the separate colloidal oxides.

The chief factors which influence the heat of wetting of soil colloids, G. J. Bouyoucos (*Soil Sci., 19 (1925), No. 6, pp. 477–482*).—In a contribution from the Michigan Experiment Station evidence is reported that the activity of soil colloids is not only a function of the size of the particles but is also a function of their physical condition. An active soil colloid may be made exceedingly inactive by changing its physical condition, although its total surface or size of particles may remain practically the same. The physical condition involves the degree of decomposition of the material, whether or not it is in a hydrated state, and whether the surfaces of the particles are smooth, porous, or vitrified. In addition to the physical condition the reactivity of the soil colloids also seems to depend somewhat upon their chemical composition.

The heat of wetting of soil colloids from different soils has been found to vary considerably, which is attributed largely to a difference in their physical condition and chemical composition. The relationship between heat of wetting and chemical composition is not so strongly pronounced as that between heat of wetting and physical condition, but there seems to be a relationship between the heat of wetting and the proportion present of silica, alumina, iron, and organic matter.

The heat of wetting is considered to be probably a manifestation of the water undergoing a change in its state of aggregation, possibly from a liquid to a solid or semisolid phase. It is also considered probable that the force which causes the attraction between soil colloids and water is both chemical and physical.

A physical theory of soil moisture relations, B. H. Wilsdon (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 473–489, figs. 3*).—In a contribution from the Punjab Irrigation Department, Lahore, a résumé of a physical theory of soil moisture relations, developed by the author, and previously noted (E. S. R., 46, p. 116), is presented, together with some observations arising from subsequent work by others.

Temperature as a factor in nitrogen changes in the soil, E. H. Pangani-ban (*Jour. Amer. Soc. Agron., 17 (1925), No. 1, pp. 1–31, figs. 4*).—Studies conducted at Cornell University on the effect of constant and alternating temperatures in connection with ammonification, nitrification, denitrification, and nitrogen fixation in soils under both aerobic and anaerobic conditions are reported.

Studies with ammonification at a constant temperature indicated that this process took place at between 15 and 60° C. (59 and 140° F.), and that at higher temperatures the rate was faster. The thermophilic organisms seemed to be very active in ammonification. The degree of variation of alternating temperature, whether 15 or 5°, affected the process to the same extent.

Nitrification at constant temperature was found to take place at between 15 and 40°, and the optimum temperature in soil cultures was about 35° or slightly higher. Alternating the temperatures depressed the process very greatly, although a daily greater degree of variation of about 15° seemed to counteract this effect. A 10- or 5-day change of temperature with the same degree of variation gave an entirely different result. With a 10-day change of temperature, starting the incubation at higher and ending at lower temperatures resulted in a much less nitrate accumulation than when the incubation took place in the reverse order.

Denitrification at constant temperature for one week showed that this process took place at between 15 and 40°, and that the optimum temperature in soil cultures lies somewhere between 25 and 30°. When the incubation period was made two weeks, the results could not be regarded as reliable, for the necessary amount of sugar added was exhausted after a week of incubation. The determination of the actual amount of nitrates in the presence of dextrose was found to be impossible. The nitrate lost by denitrification was reduced to ammonia and to albuminoid nitrogen, and there was no loss by complete reduction.

Studies of nitrogen fixation under both aerobic and anaerobic conditions showed that the process took place at between 15 and 40°, and that the optimum temperature in soil cultures for both conditions lies between 25 and 30°. There was greater fixation under anaerobic than aerobic conditions. Some indications were obtained that a soil active in one nitrogen change will also be active in the other nitrogen changes.

Influence of microorganisms upon the carbon-nitrogen ratio in the soil, S. A. WAKSMAN (*Jour. Agr. Sci. [England], 14 (1924), No. 4, pp. 555–562*).—In a contribution from the New Jersey Experiment Stations an attempt is made to explain how the more or less constant carbon-nitrogen ratio in normal cultivated soils may be, to a large extent, a result of the activities of the microorganisms inhabiting the soil. The opinion is expressed that a great many of the phenomena concerned may be explained by the nature of the carbon and nitrogen content of the soil and of the organic matter added to the soil, and the activities of fungi and bacteria. In addition, the nature of the chemical transformation brought about, as well as the environmental conditions under which these processes take place, must be clearly understood.

[Soil and fertilizer studies at the North Carolina Station] (*North Carolina Sta. Bul. 247 (1925), pp. 11–14*).—It is reported that practically all of the unlimed soils of the station plats are acid, but it has been found that liming to complete neutrality is not necessary for the best results. In a few instances soils limed sufficiently to make them alkaline have not produced satisfactory crops.

Ammonium sulfate increased the acidity, while sodium nitrate decreased it. Potassium sulfate caused a slight increase, but acid phosphate had no effect either way. Lime decreased the acidity more on sandy than on clay soils. Liming tended to increase the vigor of certain crops and thereby caused them to absorb more soil potash.

A study of the results of analyses of soils of various types indicates that the dark soils of the coastal section are high in nitrogen but low in potash and phosphate. The sandy soils of that section are low in all three of the important fertilizing constituents as well as in lime. The Piedmont and mountain soils are generally well supplied with potash, and a few of the mountain soils seem to contain a comparatively large amount of phosphate. Apparently the content of potash in the soils of the Piedmont and mountain districts increases with the size of the soil particles, the gravelly and coarse sandy soils having a greater content than the clays.

Data from studies of muck and peat lands (E. S. R., 53, p. 723) are also included together with the results of experiments with different fertilizer mixtures on prevailing soil types.

The use of concentrated fertilizers, A. B. BEAUMONT (*Amer. Fert., 62 (1925), No. 4, pp. 23, 24*).—Tests at the Massachusetts Experiment Station to determine the influence of concentrated complete fertilizers on tobacco, sweet corn, potatoes, beets, and hay in comparison with a home-mixed fertilizer of

half the concentration are reported. The fertilizers were applied to the tilled crops drilled in the row and stirred with the soil before planting, and broadcast and raked in.

The results showed that there was a slight reduction in stand in the case of two of the five crops grown when the concentrated fertilizer was applied either in the row or broadcast, but especially when applied in the row. This initial reduction in stand, however, apparently did not handicap the yield of the crops. The differences in yield were so small as to be insignificant, and the results, if anything, indicated an advantage of the concentrated fertilizers over ordinary mixtures as measured by yield. It is concluded that high-analysis concentrated fertilizers may be used safely, provided they are reasonably well mixed with the soil.

Manures and fertilizers, W. DYKE (*London: W. H. & L. Collingridge, [1924], pp. 138, pls. 8, figs. 8*).—Practical information on the science and practice of manuring, classes of manures, and fertilizer formulas for various crops is presented in this book, edited by T. W. Sanders.

The American fertilizer handbook (*Philadelphia: Ware Bros. Co., 1925, 18. ed., pp. [390], figs. 10*).—This is the eighteenth annual edition of this standard fertilizer handbook, which contains the usual reference material and directory of the fertilizer industry and allied trades.

The efficiency of ammonium sulphate as a fertiliser, J. A. PRESCOTT (*Jour. Agr. Sci. [England], 13 (1923), No. 3, pp. 333–339, fig. 1*).—Field and laboratory experiments with maize at the Bahtim Experimental Station are reported, which indicate that the lower efficiency of ammonium sulfate as compared with sodium nitrate is due principally, under the special conditions imposed, to the liberation of ammonia from the fertilizer in contact with an alkaline soil. The rate of this liberation is a function of the aeration and of the soil reaction.

Phospho-manganese in fertilization [trans. title], G. ONGARO (In *Atti del 1. Congresso Nazionale di Chimica Pura ed Applicata. Rome: Assoc. Ital. Chim., 1923, pp. 357–369*).—An artificial fertilizer containing phosphatic slag and manganese is described and its manufacture elaborated. It contains about 19.5 per cent of phosphoric acid, 8 per cent of manganese oxide, and 44 per cent of calcium oxide. It has an alkaline reaction, and differs from Thomas slag mainly in its content of manganese and the lower solubility of its phosphoric acid content. Its agricultural use is discussed, with special reference to the suspected catalytic action of the manganese content.

Manganese as a cure for a chlorosis of spinach, F. T. MCLEAN and B. E. GILBERT (*Science, 61 (1925), No. 1590, pp. 636, 637*).—In a brief contribution from the Rhode Island Experiment Station the results of studies on the use of manganous sulfate as a cure for chlorotic spinach are reported. These studies served to corroborate the observations of other workers, and seemed to point to the use of manganese salts in field work.

Easily soluble calcium of soils as an indicator of their response to liming, J. R. FLEETWOOD (*Soil Sci., 19 (1925), No. 6, pp. 441–458, figs. 5*).—Studies conducted at the Missouri Experiment Station are reported in which the calcium soluble in 0.04 N carbonated water, pH value, acidity by the Truog method, and fertility were determined in samples of soil collected from experiment fields in Missouri, Iowa, Illinois, Kentucky, and Ohio, to find the relation, if any, of these factors to the returns from lime secured on these fields.

Those soils showing strong acidity usually gave good returns from the application of lime, but there was a much closer correlation with the amount of easily soluble calcium. Soils of medium acidity showed a very definite and close relation between the soluble calcium content and the returns from lime, but no relation between the Truog acidity, pH value, and returns from lime.

Soils with slight acidity showed a much closer relation between acidity and returns from liming than did soils of medium acidity. However, the amount of soluble calcium showed a much closer relation to the returns from lime on these soils than did the acidity.

Soils giving good returns from lime applications showed an average soluble calcium content of 512 lbs. in the first 7 in., while those giving poor returns averaged 877 lbs. Many of these soils had the same acidity by the Truog method.

The amount of calcium soluble in 0.04 N carbonated water in the first 7 in. was found to be closely related to the returns for lime. All soils having less than about 650 lbs. of calcium soluble in 0.04 N carbonated water gave good returns for lime, while none having more than 700 lbs. of soluble calcium gave good returns. The amount of soluble calcium and the acidity varied in the different layers of soil.

There was a general relation between the fertility of these soils and the returns obtained from lime, with one exception. There seemed to be no very close relation between the pH value and the amount of calcium soluble in 0.04 N carbonated water. From the results obtained, the amount of calcium soluble in 0.04 N carbonated water was found to be a much more accurate means of judging the returns to be expected with any of these soils from the use of lime than was a determination of the soil acidity.

The influence of liming, temperature, and compaction on the movement of soluble salts in soils, L. C. WHEETING (*Soil Sci., 19 (1925), No. 6, pp. 459–466*).—In continuation of work previously reported (E. S. R., 53, p. 419), studies conducted at the Michigan Experiment Station showed that previous treatment with limewater brought about a more rapid distribution of potassium chloride and sodium nitrate in soils of both heavy and light textural characteristics. Monocalcium phosphate was fixed and showed no movement whatever.

It was found that salts move very slowly in a soil kept at the temperature of melting ice. At 15° C. (59° F.) the movement was increased, while at 65° a very rapid translocation occurred. Compaction studies did not show any advantage for either loose or compact soil as far as salt movement was concerned, although it is thought that at extremely low moisture contents this factor may become important.

While the intricacy and number of simultaneous reactions between soils and fertilizer salts made it extremely difficult to account for the results obtained, such things as temperature, reaction of the soil, solubility of the salt, mobility of its ions, and the ability to bring about replacement reactions appeared to be of the utmost importance in determining the distribution of fertilizers.

Sulfofication and its effect upon the oxidation of organic matter in eastern Washington soils, J. R. NELLER (*Jour. Amer. Soc. Agron., 17 (1925), No. 1, pp. 40–48, fig 1*).—Studies conducted at the Washington Experiment Station are reported, which showed that, when supplied with sufficient moisture, the arid and semiarid soils of eastern Washington exhibit a high sulfur oxidizing power. When the sulfur additions were increased above 1,000 lbs. per acre, there was a gradual decrease in the percentage oxidized.

Sulfur additions increasing up to 1,000 lbs. per acre had little effect upon the H-ion concentration of the soils studied and upon the rate of oxidation of organic matter added to the soils. Larger amounts gradually increased the H-ion concentration. Additions greater than 1,000 lbs. caused some retardation in the rate of oxidation of organic matter, but the effect was not marked except in those cases where from 6,000 to 8,000 lbs. per acre had been applied.

These results are taken to indicate that there is a high basic reserve in eastern Washington soils which will absorb comparatively large amounts of oxidized sulfur without any marked retardation of soil biochemical processes.

AGRICULTURAL BOTANY

[Carnegie Institution of Washington, report of] department of botanical research, D. T. MACDOUGAL ET AL. (*Carnegie Inst. Wash. Yearbook 21 (1922), pp. 47–75*).—Progress in the principal problems during the year is detailed below.

Photosynthesis, H. A. Spoehr.—A highly accurate method, as developed and employed, is described, in which the use of entire plants was found incompatible with high precision, about 100 hours' duration with a continuous respiration record being obtained.

The carbohydrate-amino acid relation in the respiration of leaves, H. A. Spoehr and J. M. McGee.—The authors found that the two internal factors determining the rate of respiration, the carbohydrate supply and free amino acids, are both influenced by light. A change in either component affects the rate of respiration. In view of the fact that determinations of photosynthesis are based upon differential determinations of carbon dioxide, it is considered essential that these conditions relative to the amino acid and carbohydrate content as well as to the respiration be established before any conclusions be drawn as to the rate of carbon dioxide fixation.

Mechanism of photosynthesis and the internal factor, H. A. Spoehr.—Evidence has been accumulating rapidly that in the photosynthetic process there is an essential internal factor which operates independently of the clearly recognizable factors, temperature, light intensity, partial pressure of CO_2, and water content of the leaf.

It is claimed there is in photosynthesis, first of all, the formation of an acceptor, then the primary light reaction and the secondary reaction. In the formation of the photochemical acceptor, the enzymatic or respiration process enters, and this forms the basis of the interdependence of photosynthesis and respiration.

In view of the fact that the rate of photosynthesis follows so closely the rate of respiration, the theory is proposed that these two series of reactions, proceeding in opposite directions, are actually interdependent.

The chemical reactions involved in these two processes are, in the case of respiration, a series of oxidations, and, in photosynthesis, a general reversal thereof in the reduction of CO_2 to C.

Temperature coefficients and efficiency of photosynthesis, H. A. Spoehr and J. M. McGee.—To differentiate between the two reactions in photosynthesis and to establish their properties the determination of the temperature coefficients is said to be necessary.

Carbohydrate metabolism of leaves, H. A. Spoehr.—It appears that either all of the possible hexose sugars are formed in the photosynthetic process and are then converted into the three sugars commonly found in plants, or that there are forces which permit the formation of only those sugars existing in the plant.

Influence of various sugars on respiration, H. A. Spoehr and J. M. McGee.—A study was made of the influence of sugars on respiratory activity. This work was done in conjunction with that on the carbohydrate-amino acid relation in the respiration of leaves.

When dextrose is fed to leaves, the carbohydrate content is maintained or increased. However, the rate of respiration is not dependent on the amount of available carbohydrates alone. When sucrose is given, the effect on the rate of respiration is in general of the same nature but less marked. Thus also the influence of amino acid on leaves given sucrose is not as intense as when dextrose is given. Apparently levulose is more easily oxidized than any of the other hexose sugars, lower plants showing great diversity in the capacity for using this sugar.

As to the effect of *d*-mannose on higher plants, all of the experiments showed no toxic effects but produced a relatively high rate of respiration. Similarly, the leaves given *d*-mannose were appreciably stimulated in their respiration by amino acids.

Determination of small amounts of various sugars present in leaves, H. A. Spoehr and F. A. Cajori.—A method described in a previous publication (E. S. R., 44, p. 426) has continued to yield very satisfactory results for the determination of reducing sugars. The use of the principle involved, together with the copper method, answers the requirements of determining the small amounts of the various sugars found in leaves.

Dendrographic records of growth in trees, D. T. MacDougal.—It has been found possible to differentiate the variations in the woody cylinder from those of the extreme outer layer composed of the cambium, bast, and bark. Correlations between the variations of the trunk and of the stomatal action and accompanying variations in transpiration have been established.

The artificial cell with bicolloidal membranes, D. T. MacDougal.—The type of artificial cell described in the preceding report (E. S. R., 48, p. 824) has been used extensively in a study of the nature of the exchanges between the living cell and its environment. The chief value of such a cell, as now used, is that its action shows the effect of the salts which are being absorbed on the colloidal material of the walls and membranes of the cells.

Effect of lipins in interchanges between cells and the environment, D. T. MacDougal.—Accumulating evidence on the occurrence of lipins or phosphatides in cells supports the conclusion that the external layer of protoplasm is essentially a deposit of these fatty substances. Not only are the lipins abundant in this part of the cell, but strands are found to extend into the protoplasm and into the wall. It is stated that the hydration, swelling, or absorption of water by living and by dead cells are of a kind which might be displayed by a colloidal mass surrounded by a layer of lipin or fatty material and inclosed in an extensible and highly permeable wall.

Permeability in plant cells, D. T. MacDougal.—The weight of evidence is said to point to the predominance of pentosans and of the lipins in the outer layers of plant cells, in which the proteins may play a subordinate part only. The materials of both groups of substances may be arranged so as to allow the passage of both fat-soluble and water-soluble material.

Effect of salt solutions on hydration and swelling of plant tissues, F. T. McLean.—By using solutions causing definite reactions with colloids similar to those in plant tissues or with certain groups of plant constituents, it is possible to obtain indications of the importance of these substances to the maintenance of turgidity in plants and consequently to growth.

Physical and chemical factors in the growth of asparagus, E. B. Working.—Measurements and auxographic records were made of asparagus plants grown from storage roots and from seeds, temperature, light, and soil conditions being varied in the different experiments.

Indirect factors influencing the vertical distribution of vegetation, F. Shreve.—Data on the vertical distribution of vegetation as related to differences in rainfall, movement of convectional storms, cold-air drainage, and other factors are given.

Measurements of erosion and deposition as related to vegetation, F. Shreve.—Biennial measurements were made for two years to secure evidence through bench marks as to the magnitude and chronology of the vegetational changes.

Stem analysis of Monterey pine and redwood, F. Shreve.—Study has been made of the longitudinally bisected pine (*Pinus radiata*) cut in 1921 and a redwood (*Sequoia sempervirens*) of similar size. The combination of longitudinal and transverse sections has gveñ a set of precise measurements with which to compare the rate of growth of these trees at different heights from the ground, also the correlation between growth and rainfall.

The results indicate a positive correlation between the growth of pine and redwood and seasonal rainfall.

Atmometry in South Africa, W. A. Cannon.—A comparative investigation of the evaporation power of the air in several unlike stations was initiated and carried out with the assistance of the Botanical Survey of South Africa and various scientists not connected with the survey.

On the transpiring power of some Karroo plants in winter and spring, W. A. Cannon.—The rapidity with which cobalt chloride paper changed color when placed on the surface of leaves as compared to the rate of change over a free water surface was observed in several native and introduced plants in certain of the more arid parts of South Africa, especially in the Great Karroo, in late winter and in the spring of 1921.

Seasonal changes in water relations of desert plants, E. B. Shreve.—The responses by which desert plants meet the conditions approaching the critical point of the physiological limits of their endurance were studied. The daily march of the processes dependent upon water condition was investigated for typical desert plants, comparisons being made with a cultivated plant able to thrive during certain seasons. The three native species showed ability to increase resistance to water loss with increasing aridity. The cultivated plant did not show this phenomenon, the plant dying under the more arid conditions.

Stomatal movements and the lowering of leaf temperature by evaporation show that while all of these phenomena aid in causing resistance to increasing aridity, they are not sufficient to account for the marked increase in resistance to water loss shown with increasing evaporating power of the air.

A comparison of the daily and of the seasonal water content of plant parts with the transpiring power of the plants showed that the amount of water in the plant influences the rate of transpiration. When water content is lowered, the capillary and colloidal imbibitional forces increase.

Strand vegetation of the Pacific coast, W. S. Cooper.—Particular attention was given to exploration of the dune areas of the Monterey Peninsula, and some important divergences in the successional processes from those occurring along Monterey Bay were discovered.

Endemic trees of the Monterey Peninsula, W. S. Cooper.—The distribution was mapped of the Monterey pine (*Pinus radiata*) and of Monterey cypress (*Cupressus macrocarpa*), and the results are briefly indicated.

[Studies on plant] ecology, F. E. Clements et al. (*Carnegie Inst. Wash. Yearbook 21* (*1922*), *pp. 337–358*).—Continuing previous reports (E. S. R., 49, p. 28), the progress of various studies are reported, including, in addition to those noted below, studies of the volume and composition of soil air and plant

air, experimental taxonomy, the phylogenetic method in taxonomy, relation of holard to root development and yield, transplant areas and quadrants, grazing research, destruction of the range by prairie dogs, and researches in sedimentation.

The phytometer method, F. E. Clements, G. W. Goldsmith, and J. E. Weaver.—Tests of the phytometer method were made in order to perfect sealing methods and to determine the limits of individual variability in transpiration. The application of the phytometer method during the year was made chiefly in the slope-exposure studies noted below

Slope-exposure studies, F. E. Clements and D. Lutjeharms.—Air and soil temperatures, water content, humidity, evaporaton, wind, and rainfall were measured throughout the season for the six stations, the soil temperatures having been determined at depths of 4 and 12 in. and the light intensities measured by means of chemical photometers as well as the selagraph.

The instrumental results show that the air temperature and humidity of the north and south slopes were similar during the first half of the summer, though later the south slope showed a wider fluctuation, a higher average temperature, and lower humidity. The transpiration rate on the south exposure was very high, the average water loss being three times that on the opposite slope. The plants of the north slope were taller, the stems less pubescent and but slightly woody, and the terminal rosette larger and more open.

The water cycle in plants, F. E. Clements and J. V. G. Loftfield.—Emphasis is placed upon the concentration of the cell sap, especially in the epidermis, and the conductivity of vascular systems. In all the plants studied the successive sections of an unbranched stem show an increase in both specific and absolute conduction from base to top.

Transpiration and stomatal movement in Cereus giganteus and their correlation with variations in stem diameter, J. V. G. Loftfield.—A study of variations in the trunk diameter of Cereus gave a behavior directly opposite to that of the trees previously investigated. A close correspondence was disclosed between water loss and stomatal movement, a causal connection between water loss and stomatal movement, and a causal connection between water loss and changes in trunk diameter.

Studies in aeration, F. E. Clements and G. W. Goldsmith.—Further work on the dissolved gases in bog water indicates that carbon dioxide and acidity vary in proportion to the photosynthetic activity of the algal flora. During the summer the surface water is in approximate gaseous equilibrium with the air, but anaerobic conditions usually persist at a depth of a meter or more. In open pools, where light intensities permit the growth of algae, anaerobic conditions prevail only well below the algal zone. The results so far obtained indicate that the accepted estimates of the amount of air in various soils are too high.

Photometers and photometric methods, F. E. Clements and J. V. G. Loftfield.—The simple photometer and the selagraph or recording photometer developed more than 20 years ago have been improved and modified as described.

Methods and principles in experimental pollination, F. E. Clements and F. Long.—Experiments were made of the response of insects to color, odor, mutilation, and artificial flowers and to determine the relative attraction of different species when competing with each other. The general conclusion is reached that habit is the most important factor in the behavior of pollinators, although the influence of habit varies with the group, species, age, season, time of day, and other considerations.

Factors involved in the opening and closing of flowers, G. W. Goldsmith and I. M. Johnston.—In connection with pollination experiments, the results obtained in earlier investigations are reviewed and a new series of studies begun to deal more accurately with the factors and conditions concerned in the field.

Correlation in bud development, F. E. Clements.—In the course of a comprehensive study of the movement of food within a plant, change of position, removal of buds, and feeding with glucose, development was shown to depend on the course taken by the food-laden sap in response to the competition for it. For the species employed, the proof was conclusively against the hypothesis of an inhibiting substance that suppresses lower buds in consequence of the effect of gravity.

Absorption of nutrients at various depths in relation to crop yield, J. W. Crist and J. E. Weaver.—The original problem has been extended to include not only the amounts of nitrates and phosphorus removed by crops at depths beyond the usual cultivation but also the effect upon yield. The resulting figures are detailed.

Climax formations, F. E. and E. S. Clements.—The grassland formation has again received the major attention. Studies were made of the subclimax prairie from eastern Nebraska to northern Texas, the true prairie in southern Nebraska and northern Kansas, the mixed prairie from Colorado through Wyoming into western Nebraska and through northern and central Texas, the desert plains from western Texas to the edge of the Colorado Desert, and the bunch-grass prairie throughout southern and central California.

Changes in grassland, F. E. and E. S. Clements.—The replacement of grasses by others or by scrub in consequence of grazing takes place, it is claimed, in accordance with several well-defined principles. Species that are most eaten yield to those less eaten, whether native grasses, weedy annuals, or shrubs. Tall grasses give way to short grasses wherever the two are mixed, since they are most subject to grazing. Sod formers are favored in comparison with bunch grasses because of their method of propagation and consequent hold on the soil, and sod formers with runners or stolons, such as the buffalo grass, tend to replace those that lack them, such as grama. The grasses of the lowlands are more persistent than those of the uplands because they are coarser and more vigorous and possess a better water supply, and for this reason grasses often hold out longer in sandy areas if grazing and blowing are not excessive.

Climatic cycles and tree growth, A. E. Douglass.—In a study of the record of the sun spot cycle in Sequoia, it was found that the effect of the sun spot cycle on growth depends upon topography, the basin trees showing only occasionally the 11-year period or its multiples, which are conspicuous in upland trunks. The correspondence of ring cycles in trees several hundred miles apart are said to show them to be real and climatic in origin.

Rainfall and climatic cycles, F. E. Clements.—Investigation of rainfall cycles has shown a definite relation between drought periods and sun spot maxima, every maximum of more than half the greatest annual sun spot number coinciding with general and critical drought in the western United States. Studies were in progress with reference to sun spot minima and excess rainfall, the 2- to 3-year cycle, the seasonal and monthly balance, and crop production. In many cases these short cycles seem to be related to the drought periods occurring at the sun spot maximum, while in others no such connection is evident.

Principles and methods of bio-ecology, F. E. Clements, C. T. Vorhies, and W. P. Taylor.—Attention is called to the "importance of treating plants and

animals together as mutually interacting members of a community, and hence of recognizing that plants must constitute the basis of the different units, both climax and successional."

Biotic succession in bad lands, F. E. Clements.—Further evidence was secured to indicate that the erosion cycles of bad lands are an effect of climatic cycles, and that they are in accord with other consequences of climatic changes in the West.

The theory of chlorophyll synthesis [trans. title], L. Maquenne (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 19, pp. 853–857*).—Discussion is given of views prevalent during the last 40 years regarding the chemical facts and factors in connection with chlorophyll synthesis by green plants.

Formation and digestion of starch in plant cells [trans. title], A. Maige (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 15, pp. 646–649*).—To the author, in view of facts previously known or experimentally presented, the theory best explaining the facts as actually known regarding the formation and the digestion of starch appears to require the consideration of these two phenomena as due to catalytic processes entirely distinct, the amylogenic action having its origin in the stroma of the plastid and comprising a condensing action and an inhibiting influence of the amylase of the cyptoplasm. This diastase appears to be produced by the extraplastidial cytoplasm, and its hydrolizing influence appears to be exerted through the stroma of the plastid when it is no longer subject to inhibition.

Sugar metabolism in the plant cell and amylogenesis [trans. title], A. Maige (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 19, pp. 895–898*).—Regarding the assumption long held forth that the deposition of starch in plant plastids necessitates as an absolute prerequisite the existence in the cell of a certain critical concentration of sugar, here called the threshold of amylogenic condensation, the author states, on the basis of experimentation outlined, that even in cells in which amylogenesis does not require more than a very slight concentration of sugar the essential phenomena of cellular metabolism which assure the continuity of life and the growth of living matter may go on at still lower concentration.

Influence of sugar concentration of the media on the activity of nitrogen-fixing bacteria [trans. title], G. Truffaut and N. Bezssonoff (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 15, pp. 649–652*).—The authors have studied the development of aerobic bacteria, of the kind most common in the soil, in media poor in sugar, also the influence of small percentages of sugar on the rate of fixation of gaseous nitrogen by forms specifically indicated. From the data presented in tabular form, with discussion, it is concluded that, both for the development of aerobic bacteria in a nonnitrogenous medium and for the fixation of nitrogen by those bacteria which possess that property, the weaker concentrations of sugar (about 1 : 1,000) are clearly more advantageous than those which are usually employed.

The biological significance of alkaloids in plants [trans. title], G. Ciamician and C. Ravenna (*Bul. Soc. Chim. Biol.*, *5* (*1923*), *No. 1, pp. 59–78*).—Largely, this is a review of data previously noted (E. S. R., 47, p. 31).

It is concluded that the chemical processes in plants correspond closely in kind to those in chemical laboratories, and that they are essentially similar to those occurring in connection with animal activities. The plant is regarded as a chemical mechanism.

Biochemical study on the composition of Monotropa hypopitys yielding a new glucoside, monotropitin [trans. title], M. Bridel (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 15, pp. 642–644*).—Referring, in recognition, to the

glucoside discussed by Bourquelot (E. S. R., 8, p. 29) as existing in *M. hypopitys*, the author gives an account of the presence and properties of what is claimed to be a second glucoside, obtained from *M. hypopitys* and distinct from gaultherin, for which he proposes the name monotropitin.

The physiological rôle of innervation in leaves [trans. title], V. Lubimenko and Mrs. S. Fichtenholz (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 18, pp. 833–836*).—Study of numerous plants named is said to show that the chief physiological rôle of leaf nervation in these plants is, first, to sustain mechanically the lamina, second, to transport organic substance, and, third, to transport water.

Influence of temperature on energy yield in germination [trans. title], É. F. Terroine, R. Bonnet, and P. H. Joëssel (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 3, pp. 212–214*).—Citing data from previous work by Terroine and Wurmser (E. S. R., 50, p. 428), and from that of two others named, as supporting the claim that energy yield in biological reactions is not influenced by temperature, the present authors outline experimentation carried out and data obtained in the study of *Arachis hypogea* and *Lens esculenta*, which showed energy yields, respectively, of approximately 53 and 63 per cent. These are claimed to show precisely that though temperature does influence rapidity of growth rate, it does not influence the totality of energy yield of the process of germination.

It is considered probable that the facts formerly and of late presented are not isolated instances merely, but that they are expressions of a law which holds throughout biological phenomena, namely, that the energy involved in growth does not vary sensibly with the variation range of temperatures compatible with life.

The energy yield of chlorophyll assimilation [trans. title], R. Wurmser (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 15, pp. 644–646*).—In continuance of the above, the author claims that in case of the marine alga *Ulva lactuca*, direct measurement of the energy yield of photosynthesis shows that at a given incident intensity the energy yield is at the maximum in that region of the spectrum where the chlorophyll absorbs the least, this fact according with the results of previous research.

Under optimum conditions the energy yield may exceed 80 per cent. It is still greater if the light augments respiration in normal plants.

Seed composition and energy yield in germination [trans. title], É. F. Terroine, R. Bonnet, and P. H. Joëssel (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 19, pp. 900–903*).—Having demonstrated, in the work above noted, that the gross energy yield of germination, though independent of species and variety, is greater in lentil than in peanut, the authors investigated other seeds in the same way. The mean values obtained from different economic plants ranged from 52.17 to 74.18 per cent, apparently depending on the character of the seed reserves.

Discussion is offered on what is considered as a law of general physiology, namely, that of specific dynamic action, expressing the energy output of certain transformation reactions.

The culture of plants in a sterile liquid medium [trans. title], J. Dauvergne and Weil (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 19, pp. 889–892*).—Having repeated, with modifications of technique which are described, the work of Mazé (E. S. R., 41, p. 820), the authors describe here specifically the results from work done with *Sophora* sp., which, after having had a normal course of growth, developed chlorosis and leaf cast, but which showed recovery and normal development of leaves after addition of a sterile nutritive solution.

The rôle of the hydrogen-ion concentration on the development of pigment in fusaria, C. P. SIDERIS (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 11*, *pp. 1011–1019*, *pl. 1*).—As a result of studies of 15 species and varieties of Fusarium the author claims that the development of pigment by these organisms is mainly controlled by the H-ion concentration of the culture media. Pigment was produced by practically all the different species employed in the studies in dextrose solutions at H-ion concentrations between pH 3.5 and 5.5, where the initial pH value was maintained constant by the addition of adjusting reagents.

It is stated that pigment formed may be of two kinds, diffusible and nondiffusible. The color which a pigment may take is said to depend on the H-ion concentration of the surrounding culture solution.

Effect of seeds upon hydrogen-ion concentration equilibrium in solution, W. RUDOLFS (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 11*, *pp. 1021–1026*, *fig. 1*).—In a previous paper (E. S. R., 47, p. 730) the author showed that the H-ion concentration of alkaline salt solutions was markedly changed after seeds were immersed in the solutions for about 15 hours. In the present studies the rate of the reaction changed and the existence of a definite equilibrium in the solutions which have been in contact with seeds is shown.

Influence of concentration of sea water salts on assimilation in green algae [trans. title], C. FROMAGEOT (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 17*, *pp. 779*, *780*).—Studies, under technique indicated, of *Ulva lactuca* show that photosynthesis varies very sensibly with the concentration of the sea water, the optimum being that of ordinary sea water (1.94 per cent) though assimilation is still considerable in water which is almost pure. Respiration undergoes very slight modification with changes in concentration of the sea salts.

If it be supposable that an equilibrium exists betwen the colloidal state and the electrolyte contents of the cell, it may be expected, by changing the concentration of the medium, to modify the structure of the protoplasm, the functions of which are capable of being affected in proportion to their dependence upon that structure. Photosynthesis undergoes notable alterations consequent upon change in the concentration of salts of the medium. This is regarded as a new proof of the active rôle played by the intimate constitution of protoplasm in photosynthesis.

Radioactivity of the eruptive gases of Mt. Vesuvius and other solfatara volcanoes, and their influence on the development of bacteria and of higher vegetation, J. STOKLASA and J. PENKAVA (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser.*, *3* (*1925*), *No. 2*, *pp. 327–330*).—Determinations of the electric conductibility of gas emitted by Vesuvius and other volcanic areas, as well as of the air above and in potash mines, are reported. The atmospheric electric conductivity in the potash mines was found to be as high as that of Vesuvius. The radioactivity of the air and soil is stated to favor the growth of leguminous plants and nitrogen-fixing bacteria. Nitrogen-fixing bacteria were found to be abundant in the soils of the lower slopes of Vesuvius and of the Campania, which are highly radioactive. The H-ion content of these soils is from pH 6.8 to 7.5. "It is concluded that photosynthesis in the chlorophyll cell is assisted by beta and gamma rays emitted from various radioactive substances."

The beneficial and injurious effects of short-wave rays in nature, W. KINZEL (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser.*, *3* (*1925*), *No. 2*, *pp. 331–337*).—This is a brief review of studies on the effect of different forms of energy, especially on germination of seeds.

The influence of aluminum, manganese, and iron salts upon the growth of sugar cane, and their relation to the infertility of acid island soils, W. T. McGeorge (*Hawaii. Sugar Planters' Sta., Agr. and Chem. Bul. 49 (1925), pp. 95, figs. 60*).—The results are given of a study of the toxic action of acid salts, especially those of aluminum and manganese, on the growth of sugar cane, and the possibility of toxic acidity of soil being a cause of the so-called Lahaina disease of cane.

The salts of aluminum in the concentrations present in many Hawaiian acid soils were found to have a retarding effect on the growth of cane, and often they were severely toxic, while the salts of manganese had no effect on the root growth of cane plants. The variety Lahaina was found to be quite susceptible to toxic injury. It is believed that it is the aluminum and not the acidity that retards plant growth. Cane plants grown on acid soils are said to accumulate iron and aluminum at the joints of the stalks. Aluminum toxicity is claimed to be a direct toxic action and not a phosphate deficiency. Applications of lime gave little or no immediate response.

The author believes that aluminum is a factor in the retarded growth of sugar cane on the acid soils, but not the cause of the Lahaina disease. It is considered one of the factors involved in the low fertility of some Hawaiian cane soils.

Hydrocyanic acid as a toxic agent to plant growth, R. S. Hawkins (*Jour. Amer. Soc. Agron., 17 (1925), No. 3, pp. 169–171, fig. 1*).—Studies conducted at the Wisconsin Experiment Station are reported, indicating that hydrocyanic acid, if present in the soil solution in a concentration of 1 part per million or more, will quite likely depress growth in most plants.

GENETICS

The centenary of Huxley (*Nature [London], 115 (1925), No. 2897, pp. 697–752, figs. 7*).—This consists of a series of 24 short articles dealing with the life and works of T. H. Huxley, with special reference to his contributions to biology and evolution.

[Carnegie Institution of Washington, report of] department of genetics, C. B. Davenport (*Carnegie Inst. Wash. Yearbook 21 (1922), pp. 93–125, fig. 1*).—The investigations during the year were concerned mainly with the gametic constitution, its mechanism, combinations, and somatic manifestations. Among the results announced are the experimental modification of the germinal constitution in mice, the rapid opening up of the phenomenon of aberrations in the chromosome complex of Datura and the mutations that result therefrom, and new light on the control of sex and the sex ratio.

The cell in development and heredity, E. B. Wilson (*New York: Macmillan Co., 1925, 3. ed., rev. and enl., pp. XXXVII+1232, figs. 529*).—Detailed descriptions of cell structure and function with reference to the part played by the cell in reproduction and the development of animals and plants.

Chromosomes in Avena, C. L. Huskins (*Nature [London], 115 (1925), No. 2897, pp. 677, 678*).—A cytological study of false wild oats at the University of Alberta showed chromosome conditions in at least one homozygous strain of this fatuoid form of *A. sativa* to resemble closely those reported by Winge (E. S. R., 53, p. 426) for a homozygous speltoid form of wheat. In investigations of plants from a strain of homozygous fatuoid oats of the white seeded, spreading panicle type, the reduction divisions of the pollen mother cells seemed to proceed normally in most cases, but the following irregularities occurred with apparently significant frequencies:

In diakinesis, instead of the normal 21 pairs, there may be (a) 19 normal pairs and one ring, or figure 8, or other combination of four chromosomes; and

(b) 18 normal pairs and two rings, or other combinations of three chromosomes each. The heterotypic mitosis often proceeds very irregularly. A large proportion of the pollen has been found to be abortive. The microspores are frequently arranged in rows of four or other unusual tetrad formations.

The reduction divisions of *A. sativa* and *A. fatua* proceeded with almost diagrammatic regularity in all cases examined. Numerous counts have shown 21 to be the haploid chromosome number in both species.

Studies on the inheritance of the spring and winter growing habit in crosses between spring and winter barleys, N. TAKAHASHI (*Chosen Govt. Gen. Agr. Expt. Sta. Bul., 2 (1925), No. 1, pp. 1–7, pls. 2*).—Experiments at the Suigen (Chosen) Experiment Station indicate that barley varieties may be classified as having winter growing, spring growing, intermediate growing, and pseudo-winter growing habit. In the last case the variety fails to ripen when spring sown and can not survive the winter when fall sown. The behavior of hybrids between a Japanese barley with spring growing habit and three native Korean sorts with the winter habit showed the spring habit to be dominant over winter habit, with 3:1 segregation in F_2.

Effects of continuous selection for ear type in corn, H. S. GARRISON and F. D. RICHEY (*U. S. Dept. Agr. Bul. 1341 (1925), pp. 11, pls. 2, fig. 1*).—Six strains of corn differing in number of kernel rows on the ears and in indentation of the kernels were isolated by mass selection from C. I. No. 119, a strain of Boone County White. The productiveness of the six strains and of crosses between them was compared with that of C. I. No. 119.

All of the selected strains yielded less than the parent variety. The strains departing less from the number of kernel rows characteristic of the parent variety tended to be more productive than those showing wider departure. In productivity the hybrids between selected strains ranged from about 15 per cent less to about 5 per cent more than C. I. No. 119.

The productiveness of the individual crosses was directly related to the number of kernel rows by which their parent strains differed, suggesting that the selected strains were more or less homozygous for the different combinations of genetic factors determining the different numbers of kernel rows. The authors state that on this basis close selection for a specific kind of ear would tend to bring about a homozygous condition of the factors necessary for that kind of ear, and decreased vigor and productiveness similar to that caused by inbreeding would follow.

Variation in the Kherson oat at Akron, Colorado, F. A. COFFMAN and T. R. STANTON (*Jour. Agr. Research [U. S.], 30 (1925), No. 11, pp. 1063–1082, pls. 4, fig. 1*).—Investigations at the Akron, Colo., Field Station concerned with the genetic constitution of Kherson (Sixty-Day) oats, particularly certain spikelet and floret characters, are described, with a review of selection and other experiments with the variety and notes on its agricultural importance.

Spikelet disarticulation by abscission, characteristic of Red Rustproof oats, does not occur in Kherson. Disarticulation by semiabscission breeds true in some strains, but apparently segregates in others. Most strains show the more or less rough and pointed base resulting from fracture, characteristic of *Avena sativa* varieties. Floret disjunction in strains of Kherson is predominantly by disarticulation, as in *A. sativa*, and probably is homozygous. Basal hairs appear exceedingly complex in their mode of inheritance, with several factors apparently involved.

Data on inheritance of awn type apparently shows no definite relation between the presence of awns and kernel color, contrary to the results of others. The yellow color of the Kherson strain used does not seem to carry an inhibitor for awns, since all types of awns have been found on yellow kernels. Yellow-

kerneled strains can be isolated which appear homozygous for certain awn types as well as for nearly complete awnlessness. Several factors seem concerned in the production of awns in Kherson oats, whereas only two factors for color appear to exist in the lemmas, viz. one for yellow and one for white. Yellow is predominant, and many yellow strains are homozygous. White strains in Kherson are much less numerous.

Differences of chromosomes in various races and mutants of rice [trans. title], S. NAKATOMI (*Idengaku-Zassi* [*Japan. Jour. Genetics*], *2* (*1923*), *pp. 107–115, figs. 2; abs. in Bot. Abs.*, *14* (*1925*), *No. 6, p. 807*).—Studies of the nuclear division of the pollen mother cells in 21 sorts and mutations of foreign and domestic rice indicated that the haploid number of chromosomes is 12 and that the size of chromosomes varies in different races.

Some examples of the production of anomalous races in rice [trans. title], S. SUGIMOTO (*Idengaku-Zassi* [*Japan. Jour. Genetics*], *2* (*1923*), *pp. 71–75; abs. in Bot. Abs.*, *14* (*1925*), *No. 6, pp. 810, 811*).—A dwarf arising among true-breeding offspring of Sekitori×Aikoku rice and another dwarf plant arising in a pure line of Wasesinriki No. 1 seemed to have appeared as monofactorial heterozygotes. Other anomalies, one sterile and two breeding true, are also described.

The genetics of Setaria italica [trans. title], S. SAITO (*Idengaku-Zassi* [*Japan. Jour. Genetics*], *2* (*1923*), *pp. 67–70, pl. 1; abs. in Bot. Abs.*, *14* (*1925*), *No. 6, p. 809*).—The bristles subtending the spikelets of *S. italica* are from 2 to 9 in number for each grain and are either long or short. Long × short gives long, dominant in F_1, with segregation of monofactorial type in F_2. In hybrids between the usual type with short inconspicuous panicle branches and one with long branches the latter was dominant, but in F_2, dihybrid segregation was apparent. Of the grain colors, red × orange produces orange, with F_2 segregation of orange: red: yellow=12:3:1. The author concludes that A=red, a yellow, B orange, b yellow, and A is epistatic to B.

Experiments on the breeding and heredity of sweet potato [trans. title], U. WADA (*Idengaku-Zassi* [*Japan. Jour. Genetics*], *2* (*1923*), *pp. 137–144; abs. in Bot. Abs.*, *14* (*1925*), *No. 6, p. 816*).—Sweet potatoes flower very rarely in Japan proper, whereas in the Nansei (Loochoo) Islands where these experiments were carried on, they very commonly bloom every year during November and December. Although there is some variation among different races, fruit is produced very sparingly. By artificial self-fertilization in 50 races, the author found that two-thirds of the 50 are self-sterile, while some have produced from 1 to 5 fruits per 100 flowers, others 20 to 30, and yet others nearly 50 per cent.

Hybrids between two self-sterile races or between a self-sterile and a nearly self-sterile race produced no fruits. Reciprocal crosses between a self-sterile and a self-fertile race gave fruits, and the fertility of the cross varied directly with the fertility of the self-fertile race. Crosses between two self-fertile races may result in an increased self-fertility, but in some cases resulted in complete sterility or a very low fertility. Green stem, white skin, and white flesh are reported to be dominant to red stem, red skin, and yellow flesh, respectively, the segregation taking place according to ratios of either 3:1 or 15:1.

Mutation and plant breeding in regard to the giant tobacco [trans. title], TUKADA, HIDEO, K. OKADA, and H. TERAO (*Idengaku-Zassi* [*Japan. Jour. Genetics*], *2* (*1923*), *pp. 77–93; abs. in Bot. Abs.*, *14* (*1925*), *No. 6, pp. 814, 815*).—A giant mutant occurring in an indigenous variety of tobacco yielded twice or thrice as many leaves as ordinary varieties but had such extended vege-

tative growth that its plants seldom attained the flowering stage in the field. In hybrids with an ordinary variety the giant behaved as a simple Mendelian recessive. The normal type gave 1,530 lbs. of dry leaves per acre, valued at 843 yen ($420); the giant, 2,267 lbs., valued at 1,132 yen. The quality of normal and giant was in the ratio 100 : 91.

Biannual cropping of wheat hybrids, V. H. FLORELL (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 354–356*).—Instances of successful biannual cropping of wheat hybrids in California are cited. The growing of two generations each year should prove especially applicable in the so-called Svalöf method of cereal breeding. Shortening the time requirement would materially increase the output, and growing of hybrids by summer seeding also makes possible very definite selection when breeding for earliness. On the other hand, a certain number of the segregates fail to reach maturity when grown out of the regular season, and genetic studies based thereon would not yield valid conclusions. In such cases, the system is applicable in growing not more than the F_1 generation.

Heredity studies with goldfish [trans. title], W. BERNDT (*Ztschr. Induktive Abstam. u. Vererbungslehre, 36 (1925), No. 3–4, pp. 161–349, figs. 31*).—The results of a rather extensive study of the inheritance of various characters in goldfish are reported from the University of Berlin. Three races were employed in the experiments, and the mode of inheritance of colors, atrophy, hypertrophy, a doubling of fins, position and color of eyes, body size and development, and various other contrasting characters were among those studied.

The effects of early and late breeding on the mother and the sex ratio in the albino rat, C. L. COOLEY and J. R. SLONAKER (*Amer. Jour. Physiol., 72 (1925), No. 3, pp. 595–613, figs. 3*).—The age of the mother at parturition, length of the gestation period, and average weights and sex of the young born at different parities from June to December, 1924, to 47 females varying from 3 months to over 1 year of age at the beginning of the experiment are tabulated, as well as other interesting information. The oestrous cycle of the females was carefully observed by measurements of the activity in revolving cages and by vaginal smears, and they were bred during the first three or the last 3 hours of the oestrous period. Twelve different males were miscellaneously used for the early and late breeding. There were a total of 65 matings made in the late oestrous period, of which 28 were followed by pregnancy and 37 became pseudopregnant. The average length of the pseudopregnant period was 15.2 days in the 25 animals on which records were noted. A total of 72 matings were made early in oestrum, two-thirds being followed by pregnancy and one-third by pseudopregnancy. The sex ratio was 110.5 in litters produced from matings late in oestrum and 114.6 from matings early in oestrum.

The average gestation periods for the late and early breeding were 22 days and 3 hours and 22 days and 11 hours, respectively. The litters from late matings averaged 7.42 and from early matings 5.9 young, but no effect on the size of the young was evident. The length of the gestation period increased with succeeding litters from a little over 21 days 3- to 6-months-old females to nearly 23 days in 14- to 18-months-old rats. Other observations showed that oestrum most commonly started between 4 and 10 p. m. and lasted for 12 to 18 hours. The females were most receptive during the first part of the period. The vaginal plug was invariably formed when pregnancy followed.

Sex-reversal following ovariotomy in the fowl, L. V. DOMM (*Soc. Expt. Biol. and Med. Proc., 22 (1924), No. 1, pp. 28–35*).—In studies at the University of Chicago approximately 60 Brown Leghorn birds have been ovariotomized at from 6 weeks to 6 months of age. In 12 the operation was apparently incom-

plete. The majority of the operated birds developed the secondary sexual characteristics of the male, though a few appeared capon-like. Two birds showing distinct male characteristics were found on post-mortem examination to have white testis-like organs associated with some ovarian tissue. Histological examinations showed these organs to contain seminiferous tubules. A third bird also possessed a testis-like organ which had not been examined histologically. Some operated birds which at first became very malelike later reverted toward the female sex. The author believes that this signifies the regeneration of an incompletely removed ovary.

It is concluded "that the female in the Brown Leghorn fowl has many potentialities of the male, which are normally inhibited by the presence of the ovary, and that these potentialities can assert themselves approximately fully after the complete removal of the ovary at an early age."

Hereditary visceral abnormalities in the descendants of irradiated mice, H. J. BAGG (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 271-273*).—The visceral abnormalities in 1,817 descendants of abnormal strains of white mice (E. S. R., 52, p. 524) are classified, and the results of crossing normal female mice with males having a solitary kidney and eye defects from the strain showing kidney, eye, and foot abnormalities are given. The 41 F_1 animals produced were apparently normal. Of the 441 F_2s produced, 101 were abnormal in the kidney, eye, or foot regions, as determined in autopsies made at birth. By back-crossing F_1 females with an abnormal male, 292 offspring were produced, of which 116 were abnormal.

The effect of compulsory work during gestation on the mother and young, J. R. SLONAKER and D. L. ROBERTSON (*Amer. Jour. Physiol., 72 (1925), No. 3, pp. 502-548, figs. 3*).—The results of eight experiments in which pregnant female rats were forced to take exercise in revolving cages at the Leland Stanford University are reported. In each experiment 4 pregnant females were used as controls, while 4 others were exercised daily for definite periods during gestation and up until a few days prior to parturition. The exercise was so regulated that the animals were forced to run 1 minute and rest 2 minutes during the exercising period.

The results showed that the forced exercise reduced the normal gains in weight and required a greater energy expenditure than a similar amount of voluntary activity. Forced work in the morning tended to have less effect on the voluntary activity of the rats at night than forced work in the evening. Older rats were not so much affected by forced work as younger individuals, and nonpregnant females were not as much affected as pseudopregnant or pregnant animals. Forced exercise resulted in the death of several females during gestation, tended to reduce the litter size, increased the percentage of resorbed young and abortions, and decreased the milk production during lactation, resulting in frequent starvation of the young. Death or abortion occurred most frequently at about the fifteenth day of gestation, indicating that this is a critical period in the rat.

A number of females which were supposed to be pregnant produced no young. This is attributed to a complete resorption of the fetuses in these animals.

Corpus luteum extracts and ovulation in the rabbit, W. P. KENNEDY (*Quart. Jour. Expt. Physiol., 15 (1925), No. 2, pp. 103-112*).—In experiments conducted in the department of physiology at Edinburgh University 25 rabbits were injected intravenously at intervals with fresh and dessicated extracts of the corpora lutea of cows' ovaries. In the majority of cases ovulation was inhibited in the rabbit by this treatment. Histological examinations of the ovaries and other organs of the treated animals showed that the numbers of

Graafian follicles were reduced, and continued doses of the extract resulted in degenerative changes in the ovary and, to a less extent, in the liver and adrenals. The ability to ovulate was not recovered in three months following heavy doses of the extracts. One animal in which pregnancy occurred showed a marked reduction in the number of ova produced as compared with the normal.

The pathological conditions resulting from the injection of the extract resembled a toxemia, but did not interfere with the fertility of males similarly treated. It is suggested that the preparation of the extract may have resulted in the formation of toxins, or that the alteration in the ovarian activity may have upset the sugar function of the pancreas or liver.

Continuation of secretion of the ovarian follicular hormone by the human corpus luteum, E. ALLEN and E. A. DOISY (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 303–305*).—In continuing the study of ovarian hormone (E. S. R., 53, p. 526), the authors present data to indicate that the human corpus luteum, unlike that of the sow and cow, continues to secrete the follicular hormone. Corpora lutea of females at the third month of pregnancy and lipoid extracts of placenta of three and seven months and full term females and of two chorionic vesicles at six weeks and two months of pregnancy have also given positive reactions when injected into ovariectomized rats.

Seasonal variation of thyroid size in pigeons, O. RIDDLE and W. S. FISHER (*Amer. Jour. Physiol., 72 (1925), No. 3, pp. 464–487, fig. 1*).—The average weights of the thyroids of common pigeons, ring doves, and generic hybrids have been tabulated according to the months in which they were killed or died and according to the age of the birds. These pigeons had been kept on a uniform grain diet at the Carnegie Station for Experimental Evolution, Cold Spring Harbor, N. Y., and the data were collected over a 3-year period.

The results showed a distinct increase in the size of the thyroids in the three species with the onset of the cold weather in the fall, followed by a decrease in size during the spring and summer months. Diseased animals showed more variation than normals, probably due in part to variations in the severity of the established pathological conditions. The authors believe that the seasonal variations in the thyroid size are probably associated with the necessary changes in heat production. Seasonal changes in the sex ratio are linked with changes in the size of the thyroids.

FIELD CROPS

[Crop experiments on the Newlands, Nev., Experiment Farm, 1922 and 1923], F. B. HEADLEY, E. W. KNIGHT, and L. E. CLINE (*U. S. Dept. Agr., Dept. Circ. 352 (1925), pp. 7–11, 11, 18, 19, fig. 1*).—Foremost among the crop varieties in continued work (E. S. R., 49, p. 630) have been Coast and local barley, Little Club and Baart wheat, Minnesota No. 13 and Reid Yellow Dent corn, Burbank and Netted Burbank potatoes, broomcorn, Early Amber sorgo, and common and Grimm alfalfa. Practices for the production of alfalfa and pasture crops are outlined.

In potato experiments medium-sized seed tubers produced larger yields than small tubers from the same bin, whole seed, preferably medium in size, has generally given better returns than cut seed, and April 20 to May 15 seemed to be a safe planting period.

[Recent agronomic investigations in North Carolina] (*North Carolina Sta. Bul. 247 (1925), pp. 7–10, 14, 15, 24, 25, 32, 35, 42–45, 48, 49, 66, 67, fig. 1*).—These pages summarize some of the more recent results obtained at the station (E. S. R., 53, p. 734) and substations in place effect and spacing studies with

cotton; improvement work with cotton, wheat, rye, oats, and soy beans; certification of potatoes; seeding tests with wheat and oats; fertilizer, rotation, and harvesting trials with tobacco; varietal and planting tests with sweet potatoes; and studies of grasses for winter pastures. The status of different lines of agronomic investigation is reported on briefly.

[Agronomic work in the Philippines] (*Philippine Agr. Rev., 17 (1924), No. 4, pp. 227–243, 253–278, pls. 8, fig. 1*).—These pages comprise the following articles of interest to the agronomist:

The Raising of Wrapper Tobacco in the Cotabato Valley, Mindanao, and Progress Report on Five New Hybrid Varieties of Tobacco, both by M. E. Gutierrez; A Preliminary Report on the Effect of Distances of Planting Wrapper Tobacco, by D. B. Paguirigan and N. Hernandez; Progress Report on Adlay, by P. J. Wester (E. S. R., 48, p. 630); and The Past and Present Work of La Carlota Experiment Station, by S. Asuncion.

Results of comparative tests of small grain varieties, 1912–1921 [trans. title], P. Bolin (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 258 (1924), pp. 41, pl. 1*).—Among the varieties of wheat standing highest in yielding capacity were Tule I, Tule II, and Standard, a cross between Iduna and Tystofte Små wheat. Tule II outyielded to a considerable extent the old Sammet variety, and in Götaland also gave higher yields than were secured from Sol wheat. In northern as well as southern Götaland, Pansar wheat, as compared with Sol wheat, gave the better yields of grain. The varieties Vårpärl and Kolben gave practically the same yields in the northern limits of the spring-wheat section. Svalöf Extra-Kolben produced about 7 per cent more than Vårpärl even in the most southern parts of the country. A Svalöf spring wheat known as Rubin, a cross between Dala spring wheat and Kolben, proved a better yielder than Dala and was several days earlier than the other parent.

Stjärn rye, a variety outstanding in yielding capacity in southern localities, ranked second to Improved Vasa and Petkus in more northern latitudes on account of a lower degree of winter hardiness. In the local field tests Stål proved to be a better yielder than Stjärn rye.

Gull barley, a variety with good stooling capacity, outyielded Primus, but with the differences in yield less pronounced on the better soils. Primus and Brage gave about equal yields, but both were excelled by Gull barley. Svanhals, a 2-rowed variety, compared with 6-rowed barley in Norrland gave the larger average yields, but in about half the number of experiments the results were reversed.

The white varieties of oats tested were Guldregn, Seger, Kron, Kung, Fortuna, and Eko, and the black varieties Stormogul, Klock II, Klock III, and Engelbrekt. Among the white varieties Guldregn gave the smallest yields, and among the black varieties Engelbrekt the largest. It is pointed out that from the standpoint of yielding capacity the white and black varieties seem to be about equal, but that the black varieties suffer less from dry weather in spring and early summer and that for this reason black oats are grown in the eastern and white oats in the western sections of the country. For the most northern localities the black varieties Björn, Orion, Finn, and Mesdag, and the white varieties Odal and Improved Dala are recommended. Of these varieties Orion and Odal ranked highest in yield.

The amount of variability which may be expected to occur in a determination of comparative yields in small grains, W. T. Wiener and R. Broadfoot (*Sci. Agr., 5 (1925), No. 10, pp. 305–312, fig. 1*).—A tentative report on a series of experiments concerned with field plat technique indicated that the $\frac{1}{40}$-acre plat is the most suitable for conditions at Winnipeg, if replicated

three or four times, and that the removal of two border rows on either side and to a depth of 12 in. on the ends will suffice to overcome the effect of fallow borders surrounding variety test plats.

An apparatus for testing the breaking strength of straw, M. A. WILLIS (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 334, 335, fig. 1*).—The apparatus employed in the testing of straw in cereals by the Delaware Experiment Station is described and its operation outlined.

Studies concerning the pollination, fertilization, and breeding of red clover, R. D. WILLIAMS (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.], Ser. H, No. 4 (1921–1924), pp. 58, figs. 2*).—Investigations at the Welsh Plant Breeding Station, Aberystwyth, Wales, may be summarized as follows:

I. *Self-fertilization.*—No seeds were obtained by natural self-fertilization during the dry and calm summer of 1921, calm weather probably inhibiting such fertilization. Red clover is largely self-sterile, but includes some plants slightly self-fertile when artificially self-pollinated. Degree of self-fertility may be a definite character of a plant. Self-fertility is probably heritable, but the heterozygous character of the parents may canse the progeny of self-fertile plants to vary widely in this respect. Pollen from different heads on the same plants as the stigmatic flowers can not effect self-fertilization better than pollen from the same heads as the mother flowers. The self-fertility of a plant is not increased by interpollinating vegetative cnttings. Self-fertility is greatly increased by selfing the flowers before they open, which allows the slow-growing pollen tubes to reach ovules before disintegrating. Attempts to self-fertilize by shortening the styles were not successful. The few plants investigated did not exhibit either mid season or end season self-fertility. The small amount of seed produced seems to limit the practicability of self-pollination in breeding red clover.

II. *Natural pollination by insects.*—The contribution by honeybees toward fertilization and seed production of red clover at Aberystwyth and in Montgomeryshire was practically negligible. The only insects observed to frequent red clover besides species of Bombus were three species of Lepidoptera. In the areas studied, red clover was pollinated almost exclusively by six species of bumblebees, of which *B. agrorum* Fab. and *B. hortorum* L. were by far the most numerous and important. Of three species of robber bees seen on red clover *B. soroensis* Fab. was comparatively rare, and *B. terrestris* L. and *B. lucorum* L. were fairly numerous.

The optimum period of pollination was the second to fourth week in August, when workers were most numerous. Early summer fertilization was effected largely by queens, which were rather scarce. The natural flowering period in different sorts of red clover does not coincide with the optimum pollination period, since many early forms of wild red clover bloomed from about 10 to 11 weeks, early flowering varieties 5 to 6, and late flowering varieties 2 to 4 weeks before bees were abundant. Seed production was greatly increased when flowering was delayed until early August.

III. *Artificial cross-pollination and methods of breeding.*—The relative merits of methods of breeding red clover are discussed, and the technique of hand cross-pollination and controlled cross-pollination by bumblebees is described. Group breeding under controlled conditions of cross-pollination seemed the most promising.

The best stage for cross-pollination is said to be just before or soon after the flowers have opened. Plants of a variety showed a wide range in cross-fertility, some being completely cross-sterile, probably inherently so, while others were highly cross-fertile. Floral abnormalities, dwarfness, scarcity of pollen, and diseases such as *Botrytis antherarum trifolii*, leaf mosaic, and par-

ticularly *Gleosporium caulivorum*, seemed responsible for reduced seed yields in pedigree plants. The cross-fertility of F_1 brother and sister plants apparently averaged much lower than that of the parents and of crosses of F_1 and unrelated plants. F_2 plants were more cross-sterile than F_1 plants. The F_1 plants varied greatly in degree of cross-fertility, some being fairly fertile and others completely sterile.

Note on the origin of corn [trans. title], L. BLARINGHEM (*Ann. Sci. Nat. Bot., 10. ser., 6 (1924), No. 3–4, pp. 245–263, figs. 6*).—Endeavoring to shed additional light on the origin of corn, the author describes material received from B. de Toledo, Campinas, Sao Paulo, which shows a gradual transition from an inflorescence typical of Euchlaena to one resembling Zea.

The effect of water on the cotton plant, J. A. PRESCOTT (*Sultan. Agr. Soc., Tech. Sect. Bul. 14 (1924), pp. 63, figs. 21*).—An experiment at Bahtim in 1920 and 1921 was concerned with the effect of different amounts of irrigation water on cotton plants, as shown by the growth, flowering, shedding, and bolling data. Those conditions favoring vegetative growth, such as plentiful water supply, suitable temperatures, and abundant plant food, were found to result in a delayed flowering curve and eventually in a smaller yield. Large excesses in water supply usually caused deviations from the normal curve, which appear largely due to shedding. Extremes of water supply such as to produce water logging or wilting, however, were not readily producible under the soil conditions. Water restriction had a depressing effect on the later period of the flowering curves, which was further intensified by topping.

A simple method of calculating formulas for cotton flowering curves is appended.

Potato growing for seed purposes, W. D. DAVIDSON (*[Irish Free State] Dept. Lands and Agr. Jour., 24 (1925), No. 4, pp. 374–423*).—Characteristics and production methods for good seed potatoes are outlined, with comment on varieties in greatest present demand for seed in Ireland and England. Varieties grown in Ireland are listed with their immunity to black scab and synonymy, and about 120 sorts are described.

Soy beans in Connecticut, B. A. BROWN and W. L. SLATE, JR. (*Connecticut Storrs Sta. Bul. 129 (1925), pp. 255–287, figs. 6*).—The importance of soy beans in Connecticut agriculture is pointed out, with discussion of their uses, cultural and field practices, harvesting methods, and varieties. Soy beans have been compared with other summer annuals for hay (E. S. R., 51, p. 834).

Appended tables include varietal descriptions and the acre weight of green forage, dry matter, and protein, and the number of bushels of seed per acre and the percentage rating of these factors in numerous varieties tested for different periods. A summary of these data shows that the early varieties are best for seed, nearly as good as the medium and much better than the lates in protein, but inferior to both medium and late varieties in green forage and dry matter. The medium varieties excel in everything except seed yield, being slightly lower than the earlies for that factor. The late varieties are between the earlies and mediums in green forage and dry matter and greatly below both in protein and seed production. Therefore, the medium maturing varieties appear the best for general purposes, while for seed only the earlies have a slight advantage. Late varieties are not considered suitable for Connecticut conditions.

Sugar-cane experiments in the Leeward Islands [1922–23], A. E. COLLENS ET AL. (*West Indies Imp. Dept. Agr., Leeward Isl. Sugar-Cane Expts., 1922–23, pp. [2]+54*).—Experiments with varieties and seedlings of sugar cane were carried on as heretofore (E. S. R., 51, p. 533). B. 147, B. 4507, Ba. 6032,

B. 4596, B. H. 10(12), B. 6308, and B. 3922 were found to be the best canes grown on plantations in Antigua, the last four also ranking among the best varieties in the tests.

Effect of cold on the germination of sugar cane buds [trans. title], E. M. DE CALVINO and F. MASTIO (*Chaparra Agricola, 2 (1925), No. 1-2, pp. 26-34*).—Cooling sugar cane cuttings in cold water did not favor bud sprouting as much as cooling at 0° C. in an ice box. Refrigeration favored both earliness of sprouting and number of buds germinated. Cooling for 3, 6, and 8 hours at 0° gave an advantage of 20, 22, and 18 per cent, respectively, and cooling at 1.5° for 2 hours, 21 per cent in the time required for sprouting. Treatment for 8 hours at from 3.5 to 8° and for 3 hours at from 6 to 8° caused the germination of 71 and 62 per cent, respectively, more buds than the check.

A report on tasseling, W. P. ALEXANDER (*Assoc. Hawaii. Sugar Technol. Rpts., 2 (1923), pp. 133-151*).—A summary of the experiences of technologists indicate that tasseling is influenced by available sunlight, variety, elevation, moisture and soil variations, and apparently by air currents. Normal growth conditions appear to favor tasseling. Higher cane yields can be had if mature cane does not tassel, and, at least under unirrigated conditions, if tasseled cane is not harvested fairly soon after flowering, the juices may be poorer than if the cane had not tasseled. Tasseling in some immature ratoon cane harvested before May 1 and during the first season in cane planted from January to May can sometimes be controlled by specific treatment, such as the proper application of fertilizer and irrigation. Cutting back in July (E. S. R., 52, p. 38) to prevent tasseling is held too drastic.

Deterioration of cut Uba cane, G. C. DYMOND (*So. African Sugar Jour., Cong. and Exhib. No., 1924, pp. 99-104*).—Investigations showed that normal trashed sugar cane deteriorates rapidly after 48 hours, the rate being lowest in ripe cane and highest in immature cane. Diseased cane deteriorates faster than normal cane. Cane cut and not topped until crushed deteriorates more rapidly than cane topped just before or after cutting. Deterioration or enzymic action occurs mainly during sunlight hours, action during the night being rather slight. Spraying cane after cutting with a 1 per cent solution of sodium or ammonium fluoride is said to inhibit deterioration.

Healthy mature cane burnt with fire of average intensity, so that the interior of the stalks attains 75° C. (167° F.), will keep much longer than the same cane trashed. The keeping qualities of burnt cane are largely influenced by the intensity of the fire and the original sucrose content and health of the cane.

The flowers and seed of sweet potatoes, A. B. STOUT (*Jour. N. Y. Bot. Gard., 25 (1924), No. 294, pp. 153-168, pl. 1, figs. 3*).—Published records of seed production in sweet potatoes, supplemented with data obtained by correspondance, seem to indicate definitely that seeds can very generally be obtained when plants are in good bloom provided there is proper cross-pollination, and suggest that the types of sterility operating are the nonblooming condition and either the one-sided impotence of intersexualism or, more probably, certain incompatibilities in fertilization.

Protein content of North Dakota wheat, C. E. MANGELS (*North Dakota Sta. Bul. 191 (1925), pp. 41, figs. 8*).—Extensive study was made of the relation of physical characteristics, various minor factors, climate, and soil fertility to the protein content of wheat grown in North Dakota, particularly hard red spring wheat.

Test weight per bushel was not found to be correlated with protein content of wheat, and the percentage of dark kernels did not appear to be an accurate index of protein content. The wheat crops during the period 1921-1924 in the State showed considerable variation in average protein content.

Temperature in June and July is probably the principal factor in determining the average protein content of the wheat crops in North Dakota, the relation of temperature to protein content being especially evident for the years 1921 to 1924, inclusive. Rainfall seemed less important than temperature in determining the average protein content of North Dakota wheat for these years. Irrigation decreased protein content at the Williston Substation, durums being affected more than common wheats. It appeared that some variation in protein content might be due to differences in local rainfall.

Some high protein wheat is produced in seasons when the average protein content of the crop is low. Preceding crops were seen to affect the protein content of wheat, timothy and clover pasture being followed by wheat of higher protein content than that grown on corn land, and at Fargo in 1924 sweet clover land produced wheat averaging high in protein. Legume rotations seem to favor a high-protein content and to increase greatly the possibility of producing wheat exceeding the yearly average in protein content.

The relative protein content of several varieties was observed to differ in different sections of the State. Kota exceeded other common wheat varieties grown at Fargo and Dickinson in protein content. Under the climatic conditions of the years 1921–1924 heavy infection of black stem rust decreased the protein content of such susceptible varieties as Red Bobs, Power, Bluestem, and Kitchener.

No relation appears to exist between the protein contents of the seed and of the resulting crop. While wheat harvested before maturity may have a higher protein content than normally harvested wheat, data from harvesting tests show that the increase in protein does not compensate for the loss in yield and lower test weight resulting from early cutting.

Effect of climate and other factors on the protein content of North Dakota wheat, C. E. MANGELS (*Cereal Chem., 2 (1925), No. 5, pp. 288–297, figs. 3*).—Essentially noted above.

The correlation of the protein content of hard red spring wheat with physical characteristics and baking quality, C. E. MANGELS and T. SANDERSON (*Cereal Chem., 2 (1925), No. 2, pp. 107–112*).—No significant correlation was found between protein content of wheat and the test weight per bushel in studies at the North Dakota Experiment Station. A significant positive correlation was observed between protein content and percentage of dark, hard kernels in 1922 and 1924 and a slight positive correlation in 1923. A significant positive correlation was determined between protein content of flour and loaf volume in each of the crop years 1921, 1922, and 1923.

Noxious tropical grasses [trans. title], H. VANDERYST (*Bul. Agr. Congo Belge, 14 (1923), No. 4, pp. 545–560*).—Grasses considered as weeds in Belgian Kongo include *Oryza sylvestris, Imperata cylindrica, Panicum repens, Streptogyne crinita, Cynodon dactylon, Brachiaria ciliaris,* and *Cenchrus carthaticus* in cultivated areas; and *Cynodon dactylon, Andropogon halepensis,* and *Elionurus wombaliensis* in pastures. Certain sorghums were the only grasses definitely held noxious to animals. The toxicity of *Paspalum scrobiculatum* was not confirmed.

Johnson grass eradication, J. C. OVERPECK (*New Mexico Sta. Bul. 146 (1925), pp. 16, figs. 4*).—Experimental results at the station (E. S. R., 51, p. 483) and at experiment stations in other southwestern States and the experience of New Mexico farmers indicate that while Johnson grass can be controlled by growing cultivated crops, much tillage and hand hoeing are required to suppress all growth, and the crops must be grown for two or three years in succession. Clean summer fallowing with frequent shallow cultiva-

tions with a knife cultivator will eradicate the grass in one season, and midsummer plowing while very dry, followed by the frequent use of a springtooth harrow, is often quite effective. Grass should not be permitted to go to seed along ditch banks, fences, or other uncultivated places. No spray or commercial weed killer has so far been found practical in eradicating Johnson grass.

The successful use of geese in controlling the weed in cotton fields is described.

The Zamia palm and its destruction, A. B. Adams (*Jour. Dept. Agr. West. Aust., 2. ser., 2 (1925), No. 1, pp. 71–74*).—Pouring about an egg cup of kerosene into the center of each palm seemed to be the cheapest and best means of destroying Zamia palm (*Macrozamia fraseri*) on large areas. The work should be done in dry weather, preferably in summer. Sodium arsenite treatments varied in effectiveness.

HORTICULTURE

[Horticultural investigations at the Newlands, Nev., Reclamation Project Experiment Farm in 1922 and 1923], F. B. Headley, E. W. Knight, and L. E. Cline (*U. S. Dept. Agr., Dept. Circ. 352 (1925), pp. 11, 12–15*).—Herein are presented further brief reports (E. S. R., 49, p. 636) upon miscellaneous varietal and cultural tests. That onion growing is capable of development when economically justified was indicated in satisfactory yields on river bottoms and other fertile areas. Of tomato varieties, only the early maturing sorts, such as Earliana, Earlibell, John Baer, and June Pink, are deemed of value, on account of the relatively short frost-free season. Muskmelons, when started early, also produced excellent crops. Notes are presented upon varieties of tree fruits and grapes.

[Horticultural investigations at the Sidney, B. C., Experimental Station], E. M. Straight (*Canada Expt. Farms, Sidney (B. C.) Sta. Rpt. Supt. 1924, pp. 9–21, 25–31, figs. 10*).—In addition to again reporting (E. S. R., 52, p. 639) on extended varietal and cultural tests with fruits, vegetables, and flowering plants, the author presents the results of miscellaneous investigations.

Of three systems of culture compared for the apple, namely, sod mulch, clean tillage, and cover crops, clean tillage was the most satisfactory. Using nitrogen, potassium, and phosphorus, separately and in combination, as apple fertilizers, the highest yields, based on three years' tests, were secured on the acid phosphate plats and the maximum growth on the nitrate of soda plats. With pears, the largest yields and the greatest growth were secured on the nitrate of soda area. Observations upon the effect of time of pruning on the pear, cherry, and plum showed little difference except that wounds made in midsummer or late fall failed to heal readily until the succeeding season.

In a test of four systems of planting strawberries, namely, the hill, hedge, half-matted, and full-matted row, the highest yields were obtained with cultivated, hilled plants. Attempts to promote, by pruning, the production of early ripe tomatoes and to increase yields were unsuccessful, the unpruned plants fruiting as early and, in the case of one variety, Bonny Best, outyielding the pruned plants.

The Constance Hinton sweet pea was found to be in a mutating condition. All offtypes or rogues were discarded in 1923, yet the variety again broke badly in 1924, yielding about 25 per cent of rogue plants.

[Horticultural investigations at the Summerland, B. C., Experimental Station], W. T. Hunter (*Canada Expt. Farms, Summerland (B. C.) Sta. Rpt. Supt. 1923, pp. 8–41*).—As in the preceding year (E. S. R., 50, p. 339), there are

discussed, in addition to general varietal and cultural information on fruit, vegetables, and flowering plants, the results of cultural studies with the apple.

Trees intercropped with hairy vetch not only outyielded but also made greater trunk girth than trees in either continuous clean culture or alfalfa sod. Observations on the keeping qualities of apples harvested from single trees in the various cultural plats showed as much variation between trees within a single treatment as between trees in the different cultural areas. The trees in the continuously tilled areas were characterized by small-sized and light-green colored leaves, indicating a lack of nitrates. The advantages of clean culture, namely, early maturity, minimum amount of irrigation water required, and comparative freedom from rodent injury, were offset by the lower production and poorer growth of the trees, and the injured physical condition and reduced fertility of the surrounding soil. In addition, the cost of clean culture was excessive.

Apple thinning experiments indicated that heavy and moderate thinning, although reducing the amount of cull and low-grade fruit, also reduced the yield of extra fancy and fancy grades. Light thinning, on the other hand, resulted in the production of a relatively large amount of high-grade fruit, without materially increasing the amount of culls and low-grade fruit. Although unpruned trees produced the largest quantity of fruit, the percentage of inferior grade was relatively high. The heavier the pruning practiced the later were apple trees to come into production, suggesting that, especially with filler trees, pruning should be light.

In seeking information in regard to the correct time to pick apples, it was found that the fruit of all varieties continued to increase in size up to the time it fell from the trees, or in the case of the winter varieties as late as November 8. Furthermore, apples allowed to remain on the trees as late as possible took on a higher color and attained better quality. It is considered that changes in the under or ground color of the fruit are the most reliable indices of the time that apples should be harvested. Seed color was not reliable in that this condition was found to be decidedly a varietal characteristic. *Storage studies with apples indicated that ventilation is* highly desirable, there being found much less rot and less shriveling in the ventilated chambers, and, also, the flavor of the ventilated fruit was superior. Comparative data on apples, part of which were placed immediately in storage and part allowed to remain in the orchard for a short time following harvest, yielded negative results, all of the fruit keeping fairly satisfactorily. The value of wrapping apples in paper was found to depend upon the stage of maturity at the time of harvest; where fruit was picked on the proper date good results were obtained whether wrapped or unwrapped.

The investigation of Jonathan breakdown is again discussed (E. S. R., 52, p. 538).

[Horticultural investigations at the] State experiment orchard, Berri, C. G. Savage (*So. Aust. Min. Agr. Rpt. 1924, pp. 25-27*).—Attempts to induce shy-bearing orange trees to fruit more freely by removing a strip of bark 0.125 in. wide from about the base of the trunk were successful, such trees carrying a heavy crop of fruit, while control and root pruned trees bore light crops. The process is not, however, fully recommended because of the lack of knowledge of the ultimate effect of girdling on the welfare of the tree. Fertilizer trials with various deciduous citrus and vine fruits showed complete fertilizer to be most satisfactory. However, results with partial fertilization indicated that nitrogen is the most important ingredient.

Hybridization technique with especial reference to the cabbage [trans. title], J. BECKER (*Gartenwelt, 29 (1925), No. 35, pp. 597–599, figs. 8*).—An illustrated article relating to the various details of controlled pollinations.

The A B C of tomato culture under glass, W. DYKE (*London: Lockwood Press, [1925], pp. [6]+191+[3], figs. 3*).—General information is given on fertilizers, training, pollination, temperature requirements, pest control, marketing, etc., prepared for the English glasshouse tomato grower.

The effect of grass on trees, A. HOWARD (*Roy. Soc. [London], Proc., Ser. B, 97 (1925), No. B 683, pp. 284–321, pls. 6, figs. 4; abs. in Agr. Jour. India, 20 (1925), No. 4, pp. 285–317, pls. 6, figs. 4*).—A report upon investigations conducted at Pusa, north Bihar, India, upon the deleterious effect of grass sod upon fruit trees.

Following two years of cultivation, the central portion of a newly established fruit plantation, including the plum, peach, custard apple, guava, mango, litchi, sour lime, and loquat, was sown to a single species of grass. Later, when injury was manifested on the grass area, a portion thereof was provided with aeration ditches, 1.5 ft. wide and 2 ft. deep and filled with broken bricks. The deleterious effect of grass was striking, only four of the eight species, the peach, litchi, mango, and guava being able to survive at all, and of these four only the guava making even a fair growth. The leaves of the sod-grown trees were smaller, yellower, and abscised prematurely. The trees flowered late and sparingly and bore small, tough fruits characterized by a very high color and early maturity.

Incident to the sharp demarcation between the rainy and dry seasons at Pusa, there was noted a well-defined periodicity in root activity in response to moisture. Observations upon tilled trees showed that the deep roots were active in the dry season, becoming inactive with the rising water table due to rains, at which time the superficial roots resumed active growth. With one exception, namely the guava, the grass tended to restrict the development of the superficial root system, to force the roots downward, and to reduce very markedly the number of active rootlets produced in the upper soil during the rainy season. Grass had no appreciable effect on either the growth or activity of the deep soil roots, indicating that trees under grass are able to utilize the moisture and minerals in the lower soil layers. Roots of adjacent tilled trees were observed to avoid sod areas, either by turning abruptly downward or to one side. Where grass was sown among older trees the damage was less marked, but the order of injury was practically the same.

The influence of aeration trenches in modifying the injurious effect of grass was found to be irregular, no effect being noted on the custard apple or lime trees, all of which died, while the plum trees were slower in dying and the loquats were enabled to continue an uncertain existence. A study of the root distribution in the aerated section showed the superficial roots to be much larger and better developed than those under the ordinary grass, except in the case of the guava, where no difference was found. Root development was particularly vigorous in the vicinity of the trenches, indicating a response to an increased oxygen supply.

The author believes that grass is harmful in two ways, (1) by restricting aeration of the surface roots during the monsoon, at which time the growth of grass and the activity of the upper root system occur concurrently, and (2) by reducing the supply of available nitrogen. Since the trees were able even in the driest period to obtain water from the deep soil, it is concluded that soil moisture was not a determining factor. Determinations of carbon dioxide in the soil air showed throughout the entire years more carbon dioxide under grass than under tillage, leading the author to believe that too much carbon

dioxide rather than a lack of oxygen was the injurious factor. That grass in itself is not toxic to trees, but injures them by reducing the supply of available nitrogen, was shown in the case of grass-grown guava trees, which when supplied with sulfate of ammonia at the rate of 1,000 lbs. per acre made an even better growth and fruition than did comparable tilled trees.

An examination of forest trees, which in the vicinity of Pusa are able to thrive despite grass, indicated that their surface roots are better adapted to poor soil aeration, apparently being able to reach the surface and thus obtain oxygen. The ability of the guava to survive is thought to lie likewise in its ability to form a vigorous superficial root system under sod, with rootlets reaching the soil surface during the rainy season.

A handbook of hardy fruits more commonly grown in Great Britain, E. A. Bunyard (*London: John Murray, 1925, pp. 258*).—Supplementing an earlier volume (E. S. R., 45, p. 135), which dealt with the apple and the pear, this volume presents brief descriptions of stone and bush fruits, berries, nuts, etc.

Propagation of deciduous fruits, J. L. Stahl (*California Sta. Circ. 294 (1925), pp. 24, figs. 21*).—A comprehensive discussion of deciduous-plant propagation, including budding, grafting, layering, stratification, planting of seeds, etc. Although special reference is made to the apple, pear, almond, apricot, cherry, peach, plum, and walnut, attention is also paid to the bush fruits and the strawberry.

Variation in growth of nursery grafts, R. H. Roberts (*Science, 62 (1925), No. 1607, p. 356*).—Noting the position of the top bud of apple scions in relation to the point of union of the scion and stock, the author found, in examining 907 apple grafts at the Wisconsin Experiment Station in early June, a much higher percentage of actively growing plants in those grafts in which the top bud was directly above the matched side of the tongues than in any other position. The records of good, thrifty plants were as follows: (1) Bud above the matched side of the tongues 91.9 per cent, (2) bud above the lower lip of the scion 9.9 per cent, (3) bud above the unmatched side of tongues 0, and (4) bud above the lip of the stock 4.6 per cent. Furthermore, in grafts made with pieces of equal size, there were 6 per cent more good, 19 per cent more medium, and 25 per cent less dead and poor growths than in grafts combining stock and scion of unequal dimensions.

The advantage of placing the top bud directly above the point of union is deemed by the author to lie in the simple fact that transpiration water rises most rapidly in a straight line, with only slow lateral movement.

Burr-knot of apple trees: Its relation to crowngall and to vegetative propagation, C. F. Swingle (*Jour. Heredity, 16 (1925), No. 9, pp. 313–320, pl. 1, figs. 3*).—An examination of approximately 500 apple varieties growing at the Arlington, Va., Experimental Farm revealed the presence of burrknots, or rudimentary roots, on the stems of nearly one-half of the varieties. Further observations indicated that these burrknots were not pathological in nature, but simply varietal characteristics capable of serving as an aid in the classification of apple varieties. Indications were obtained that varieties possessing the tendency to form burrknots are freer rooting from cuttings or layers than the ordinary variety. It is believed that the similarity of burrknot to hairy root has often led to the discarding of otherwise promising apples.

The Queensland raspberry, Rubus probus, a species adapted to tropical conditions, J. P. Griffith (*Jour. Heredity, 16 (1925), No. 9, pp. 328–334, figs. 4*).—Reputed to have originated in Australia as a hybrid between a variety received from Japan as *R. ellipticus*, and *R. rosaefolius*, this raspberry was first introduced into Porto Rico in 1912, where it has shown exceptional promise

because of the vigor of the plant and a tendency to bear over a long period. The Queensland raspberry may be propagated readily by seed, suckers, or root cuttings. Following a description of the plant and the fruit, the author states that crosses have been made with the Cuthbert in an attempt to improve the quality and the shape of the fruits.

Further results obtained from the sowing of caprifig seed [trans. title], B. LONGO (*Atti R. Accad. Naz. Lincei, 5. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 33 (1924), II, No. 7–8, pp. 228, 229*).—Following a preliminary paper (E. S. R., 39, p. 544), in which it was reported that of 5 plants raised from seed of wild caprifigs, 1 bore edible figs and 4 caprifigs, and, of 2 plants raised from cultivated caprifig seeds, 1 bore edible figs and 1 caprifigs, the author presents the results obtained with the remainder of the seedling population, all of which have now fruited. A single plant raised from seed of the wild caprifig yielded caprifigs, and of 13 plants grown from seed of cultivated caprifigs, 2 plants bore edible figs and 11 bore caprifigs. Summing up, of a total population of 21 trees, 4 bore edible figs and 17 bore caprifigs.

American stocks in viticulture, A. M. DU PLESSIS (*Union So. Africa Dept. Agr. Jour., 10 (1925), Nos. 4, pp. 328–333, figs. 2; 5, pp. 391–404, figs. 8*).—Briefly describing grape stocks in three groups, pure American species, Americo-American hybrids, and Franco-American hybrids, the author discusses the adaptability of particular varieties to South African conditions.

Pruning the olive, I. AGUILÓ CORTÉS (*La Poda Racional del Olivo. Tortosa, Spain: Estación Olivarera, 1924, 3. ed., rev., pp. 47, figs. 13*).—A third and revised edition of a practical treatise upon the pruning of the olive.

Tropical gardening and planting, with special reference to Ceylon, H. F. MACMILLAN (*Colombo and London: Times of Ceylon, 1925, 3. ed. pp. XVI+594, pls. 3, figs. 389*).—A third, enlarged and fully revised edition (E. S. R., 32, p. 45) of this manual of trees, shrubs, and flowering and vegetable plants adapted to tropical countries, containing brief descriptive information and data concerning the gardening operations.

The coffee industry of Kenya Colony, A. D. LE P. TRENCH (*Kenya Colony Dept. Agr. Bul. 1 (1925), pp. 13*).—General information on the history, development, and present status of the coffee-growing industry, the value of exports, etc.

Cool storage of Washington Navel oranges: Results of recent experiments, J. E. HARRISON (*Jour. Dept. Agr. Victoria, 23 (1925), No. 7, pp. 428–432*).—Earlier investigations (E. S. R., 51, p. 241; 52, p. 539) having shown that molds are the limiting factor in the storage of oranges, tests were continued to determine the conditions which underlie the development of mold.

Oranges held for a short time at a temperature of 70° F. until the skin became pliable and velvety were markedly more resistant to mold in storage than unprocessed fruits. In 34° storage, at the end of 14 weeks the processed oranges contained 87 per cent and the unprocessed oranges 50 per cent of sound fruit. At 38° the percentages were 59 and 39, respectively. Paper wraps failed to function as protectors from mold. Incidentally, it was noted that the largest-sized fruits were most susceptible to mold. Comparing wrapping and the sweating process as means of combating mold, it was found that the latter was much more effective. The dipping of oranges in a solution of Chinosol failed to show any significant results. That oranges from different sources may differ slightly in their resistance to freezing injury was shown in an examination of fruits placed in a single storage chamber where a temperature of 30° was occasionally reached. Chemical examination showed the less resistant oranges to contain less sugar. Temperatures fluctuating below 32°

are not considered safe for orange storage. Since oranges placed in 34° storage showed considerably less mold than those in 38°, the former temperature is recommended, combining safety from freezing and comparative freedom from disease.

Chrysanthemum culture, G. CHABANNE and A. CHOULET, rev. by P. RIVOIRE (*Culture des Chrysanthèmes. Lyon: Rivoire, 12. ed., rev., pp. XI+107, figs. 31*).—A discussion of the production of chrysanthemums both as single specimen flowers and as bush plants. Papers are included on The Pollination of Chrysanthemums, by R. Gérard (pp. 54–68), and on The Diseases and Parasites of Chrysanthemums, by J. Chifflot (pp. 69–91).

Classified list of daffodil names, 1923 (*Westminster, Eng.: Roy. Hort. Soc., 1923, pp. 93*).—A comprehensive list prepared for use at all exhibitions of the Royal Horticultural Society, with names arranged alphabetically and the original introducer and class indicated.

The roses, COCHET-COCHET and S. MOTTET (*Les Rosiers. Paris: Libr. Octave Doin, 1925, 5. ed., rev. and enl., pp. XIX+379, figs. 70*).—This revised and enlarged edition (E. S. R., 36, p. 242) contains general information on the botany of the rose, hybridization, propagation, general culture, varieties, etc.

FORESTRY

Factors affecting reproduction of Engelmann spruce, W. C. LOWDERMILK (*Jour. Agr. Research [U. S.], 30 (1925), No. 11, pp. 995–1009, pls. 6*).—Studies carried on in representative cut-over and burned areas in western Montana during the summers of 1920 and 1921 indicate that, contrary to its effect on Douglas fir and western white pine, duff is unfavorable to Engelmann spruce reproduction. Records taken in 1921 on germination and survival of Engelmann spruce seedlings from seed sown in October, 1920, show germination percentages of 24, 34, and 14 and survival percentages of 83, 76, and 0.7 in ashes, bare soil, and duff, respectively. The critical factor is deemed by the author to be the availability of soil moisture during the dry season.

Observations in a transect of a valley burned over in 1910 showed that Engelmann spruce is able to reproduce on burned-over areas in the spruce type if the soil is favorable to germination and survival and if a supply of seed is present. Lodgepole pine was found to be better suited to the exposed southern slopes than was the Engelmann spruce. Observations in openings in the virgin forest showed that Engelmann spruce occurs there on decaying logs and wherever the mineral soil is exposed, though not in sufficient quantity to insure restocking the stands following cutting. Observations on cut-over lands indicated that Engelmann spruce is unable to survive where the surface litter is deep and undisturbed, or where the grass has become established. However, it was noticed that in excavations made in the course of railroad construction there was a very satisfactory reproduction. Based on the results of the investigations, improved logging operations favoring the reproduction of this important species are suggested.

Some observations on tapping of Hevea, W. N. C. BELGRAVE (*Malayan Agr. Jour., 13 (1925), No. 8, pp. 257–270*).—Investigations in selected plats of rubber trees located in different parts of Selangor, in the Malay Peninsula, indicate the possibility of distinguishing productive and unproductive individual trees with comparatively simple observations.

The exposure of the tapping surface of the tree to morning sunlight had no stimulating effect on the flow of latex. Determination of the acidity of the latex of individual trees showed no definite relationship with yield. In respect to viscosity, many poor yielders and no very high yielders gave latex of high

viscosity. Determinations of the coefficient of correlation between the girth of the tree and yields gave 0.39±0.08 in one plat of 46 trees and 0.55±0.06 in another plat of 60 trees. However, the author does not consider that selection by girth is satisfactory for either thinning or breeding work.

Studies in tapping technique indicated that methods involving long cuts and long intervals are not commercially feasible, the increased flow being offset by a too rapid consumption of bark in proportion to the latex obtained. The different response of trees on hilly and on level land to long cuts suggested to the author that water supply may be a limiting factor in production.

Tree distribution under the Kinkaid Act of 1911 (*U. S. Dept. Agr., Misc. Circ. 16 (1925), pp. 14, figs. 11*).—Forest trees distributed free to settlers in western Nebraska from the Bessey Nursery of the Nebraska National Forest have in many instances made satisfactory growth despite the semiarid conditions prevailing. Information is presented in this circular upon the growth attained on some of the plantations and upon the expected rate of growth for the various species found suitable to the area. The best methods of handling, planting, and caring for young forest trees are discussed. Suggestions are given for making application for trees.

Sand dune reclamation in Palestine, F. J. Tear (*Empire Forestry Jour. [London], 4 (1925), No. 1, pp. 24–38, pls. 3*).—Work at two forestry stations established in 1921 near Acre and Gaza in an attempt to control the drifting of sand, which along the Palestine coast has become a constant menace to farms, villages, railway and telegraph lines, etc., has given promise of success. As a primary barrier, brushwood fencing gave the most efficient results, especially when the resultant sand dune was planted with *Ammophila arenaria*, an indigenous beach grass capable of surviving in spite of drifting sand. In comparing direct sowing with planting of forest trees, the results to date are decidedly in favor of the use of transplants. Fairly promising results were attained by using *Acacia* spp. on land planted the same season with beach grass, but it is thought that the success would have been much greater had the sowing of the forest seed been deferred for one or two years. Of the many forest species tried, *Tamarix articulata* and *Acacia cyanophylla* have been the most successful.

The Wichita National Forest and Game Preserve, S. M. Shanklin and J. E. Scott (*U. S. Dept. Agr., Misc. Circ. 36 (1925), pp. 11, figs. 6*).—This circular contains popular information regarding the location, accessibility, and plant and animal life in the Wichita National Forest and Game Preserve, with suggestions, embracing park regulations, for prospective visitors.

Annual report of the Forest Department [Uganda] for the year ended 31st December, 1924, R. Fyffe et al. (*Uganda Forestry Dept. Ann. Rpt. 1924, pp. 20*).—This, the usual annual report (E. S. R., 52, p. 843), contains administrative information.

Revised list of forest officers of the British Empire (*Empire Forestry Jour. [London], App. No. 1 (1925), pp. 33*).—A revised list (E. S. R., 49, p. 643) published by the Empire Forestry Association, Imperial Institute, London.

DISEASES OF PLANTS

Author and subject index to the publications on plant pathology issued by the U. S. Department of Agriculture up to January 1, 1925, compiled by J. M. Allen (*U. S. Dept. Agr., Library, Bibliog. Contrib. 8 (1925), pp. 158*).—Author and subject indexes are given to the Department publications in plant pathology.

Some common New Mexico plant diseases, R. F. CRAWFORD (*New Mexico Sta. Bul. 148 (1925), pp. 25*).—A popular bulletin is given descriptive of plant diseases that have been observed in New Mexico, together with suggestions for their control.

Plant diseases (*North Carolina Sta. Bul. 247 (1925), pp. 29–31, 32–34, figs. 5*).—For the control of bacterial wilt of tobacco, four or five years' rotation with crops not subject to the wilt disease is recommended. It is claimed that the leaf spot of tobacco, commonly known as wildfire, can be prevented by the use of disease-free seed or seed that has been disinfected, new plant bed cloths or sterilized old ones, and new plant beds or thoroughly disinfected ones.

For the control of cotton anthracnose, it is said that the organism may be killed by dry heat at a lower temperature than is necessary to kill the cotton embryo.

Some attention has been given to dewberry anthracnose, which it is claimed can be controlled by the removal immediately after harvest of all the old canes and spraying at proper times.

Sulfur as a fungicide.—I, Colloidal sulfur, H. C. YOUNG (*Abs. in Phytopathology, 13 (1923), No. 1, p. 60*).—Colloidal sulfur prepared by three different methods was tested as to its toxicity with *Colletotrichum gossypii*, *Glomerella cingulata*, *Gloeosporium venetum*, *Botrytis cinerea*, *Sclerotinia cinerea*, *Phomopsis* sp., *Macrosporium sarcinaeforme*, and *Fusarium oxysporum*. In this form sulfur was found to be very toxic within a narrow limit of H-ion concentration (about pH 5.8) to all the organisms used. The finer colloidal particles were the more toxic, and a lessening of toxicity with increase of size was noted, the more finely divided flowers of sulfur being more toxic than was the article sold on the market. The toxicity was also influenced by the pH, the point of greatest toxicity being the same as in the case of colloidal sulfur. Dilute lime sulfur (1–8) is alkaline beyond the pH range, but changes within a few hours after spraying to pH 6 to 7.

New Jersey dry-mix, an effective summer fungicide for tree fruits, A. J. FARLEY (*New Jersey Stas. Circ. 177 (1925), pp. 8, figs. 2*).—This circular, which describes the New Jersey dry-mix composed of superfine sulfur, hydrated lime, and casein lime, is largely based on a previous publication of the station (E. S. R., 49, p. 349).

Influence of temperature on the morphology of Fusarium spores, H. JOHANN (*Abs. in Phytopathology, 13 (1923), No. 1, p. 51*).—Experiments with fusaria indicate that the temperature at which the fungus is grown may affect the size, shape, and septation of the macroconidia.

The pathogenicity of Fusarium moniliforme on cereals, A. W. HENRY (*Abs. in Phytopathology, 13 (1923), No. 1, p. 52*).—Single spore cultures of *F. moniliforme* isolated from wheat seed from Missouri and from wheat sick soil at University Farm, St. Paul, Minn., proved virulently pathogenic to spring and winter wheat, barley, field corn, and sweet corn, and also attacked rye and oats. The fungus was easily reisolated, and both cultures killed wheat seedlings growing on nutrient agar in large test tubes. They also killed or stunted wheat plants growing in sterilized soil inoculated with the organism in the greenhouse. The culture isolated from wheat seed and that from the soil differed slightly, but both corresponded closely with the description of *F. moniliforme*. The temperature growth optimum appeared to be near 30° C. (86° F.).

Biologic specialization of Puccinia graminis avenae, E. C. STAKMAN, M. N. LEVINE, and D. L. BAILEY (*Abs. in Phytopathology, 13 (1923), No. 1, p. 35*).—As a result of cooperative investigations (E. S. R., 49, p. 840) between the

Minnesota Experiment Station and the Office of Cereal Investigations, Bureau of Plant Industry, U. S. D. A., it is stated that certainly four and probably five biologic forms of *P. graminis avenae* can be identified by their action on Victory (C. I. No. 1145), White Russian (C. I. No. 1614), and Monarch Selection, the first of these being completely susceptible, the second very resistant, and the third practically immune to one of these forms. All three varieties are extremely susceptible to a fourth form. In some cases the heterogeneous (X) type infection described for wheat rust developed on Monarch Selection, thus indicating the probable existence of a fifth form. The behavior of these forms is consistent. Forms I, II, and V are widely distributed in North America. Form IV was collected in Sweden, and Form III came from South Africa.

Biologic specialization of Puccinia graminis secalis, M. N. LEVINE and E. C. STAKMAN (*Abs. in Phytopathology, 13 (1923), No. 1, p. 35*).—As a result of inoculation experiments made by the Office of Cereal Investigations, U. S. D. A., in cooperation with the Minnesota Experiment Station, it has been found that *P. graminis secalis* consists of several biologic forms, as is the case with *P. graminis tritici, P. graminis avenae, P. coronata*, and *P. triticina*. As rye is cross-pollinated, the study of the biologic specialization in *P. graminis secalis* presents considerable difficulty. However, even such commercial rye varieties as Rosen, Swedish, and Prolific so react as to indicate that two, probably three, distinct biologic forms exist of *P. graminis secalis*. One form attacks heavily all three varieties, while another attacks Rosen heavily, Prolific moderately, and Swedish weakly. A third form produces normal infection on Swedish and Prolific, but weak infection on Rosen.

Intracellular bodies associated with the rosette disease of wheat, H. H. MCKINNEY, S. H. ECKERSON, and R. W. WEBB (*Abs. in Phytopathology, 13 (1923), No. 1, p. 41*).—Microscopic studies on wheat rosette (formerly called foot rot or take-all) showed the presence of unusual intracellular bodies in the basal tiller tissues of plants in early stages of the disease, also in wheat leaves showing a mosaic-like mottling similar to that seen on certain plants, some of which were not known to be subject to mosaic. They have not been found in plants free from rosette and the mosaic-like mottling. These bodies are described as resembling in certain particulars those described in connection with corn mosaic by Kunkel (E. S. R., 51, p. 449), but more closely those described in connection with tobacco mosaic by Iwanowsky and by Lyon (E. S. R., 46, p. 346) in connection with sugar-cane Fiji disease. The symptoms of the wheat rosette disease resemble those of corn mosaic as described by Kunkel.

The occurrence of zonate eye-spot on various grasses and its mode of extension, C. DRECHSLER (*Abs. in Phytopathology, 13 (1923, No. 1, pp. 59, 60)*).—During the summer of 1922, *Helminthosporium giganteum*, said to have been originally described as on *Cynodon dactylon*, was very destructive on this grass and on *Phalaris arundinacea*, and present on a number of others named as near Washington, D. C. *Eleusine indica, Bromus inermis, Agropyron repens, A. elongatum, A. intermedium*, and *Lasiagrostis splendens* were severely attacked. Moderate infections occurred on *Agrostis stolonifera, Elymus virginicus*, and *Leersia virginica*. Moderate or variable spotting was caused on *Pennisetum japonicum, Panicum dichotomiflorum, P. gattingeri, P. clandestinum, P. anceps, Eragrostis major, E. pectinacea, Muhlenbergia mexicana, M. schreberi, Poa pratensis*, and *Phleum pratense*. External moisture, as heavy dews and moderately prolonged rains, largely conditions the destructiveness of this fungus and the intermittent development which results in the characteristic zonation of the spots.

Botrytis rot of the globe artichoke (Cynara scolymus), G. K. K. Link, G. B. Ramsey, and A. A. Bailey (*Abs. in Phytopathology, 13 (1923), No. 1, p. 58*).—Botrytis rot (*B. cinerea*), originally infecting and frequently developing contamination in the field, causes heavy losses in shipments of the globe artichoke from California.

Successful inoculations were obtained by using, as inoculum, spore suspensions, potato agar cultures, and infected bud scales, the first method approximating original field and transit infections and the third being the way in which the disease spreads in transit. The rot develops most rapidly at temperatures between 68 and 75° F.

A bacterial disease of brome-grass, C. S. Reddy and J. Godkin (*Phytopathology, 13 (1923), No. 2, pp. 75–86, pls. 2*).—Studies continued since 1919 are outlined as applied to a disease of *Bromus inermis*, apparently newly noted in 1916 in North Dakota, and now to be found also in Wisconsin.

The disease is thought to overwinter in lesions in the dead brome grass and possibly to transmit the infection through the seed. Some 23 species of the genus Bromus, oats, and quack grass have been artificially inoculated. Natural infections have been found on *B. inermis* and *Agropyron repens*. The organism isolated as casual is a bacterium falling under *Bacterium coronafaciens*, and has been described under the full varietal name *B. coronafaciens atropurpureum*.

Work upon Fusarium-resistant cabbage in 1922, L. R. Jones, J. C. Walker, and E. C. Tims (*Abs. in Phytopathology, 13 (1923), No. 1, p. 57*).—The work on Fusarium-resistant cabbage during the two years preceding this account was essentially a continuation of that of previous years (E. S. R., 44, pp. 643, 748; 45, p. 243; 49, p. 644; 51, p. 446), with increasing attention to Fusarium-resistant strains of certain early cabbage varieties. The need is stressed for the careful growing by responsible parties of yellows-resistant cabbage seed.

Fusarium resistant cabbage: Progress with second early varieties, L. R. Jones, J. C. Walker, and J. Monteith, Jr. (*Jour. Agr. Research [U. S.], 30 (1925), No. 11, pp. 1027–1035, pls. 2*).—In a previous publication (E. S. R., 44, p. 643) an account was given of the successful breeding of several types of cabbage resistant to yellows when grown in Wisconsin and vicinity. Subsequent reports showed that the fungus *F. conglutinans* was widely distributed, and a report is given of the progress made in developing more diversified types adapted to various local or regional needs.

Progress has been made with the selection of yellows-resistant second early varieties of cabbage. The authors believe that their work with the All Head Early and the Glory-Copenhagen types has progressed to a stage where the resistant strains are approaching commercial value.

Yellows-resistant celery: Third progress report, G. H. Coons and R. Nelson (*Abs. in Phytopathology, 13 (1923), No. 1, p. 56*).—In this third report (E. S. R., 47, p. 350; 50, p. 651) it is stated that seed production of Golden Self-blanching celery resistant to yellows (*Fusarium* sp.) was continued during 1921, tests being made of the progenies of individual plants for resistance. About 1 lb. of the resistant seed is now available. The second generation plants from most isolations possess the same tolerance as the parents and have developed well in infested soil in which commercial seed failed.

The Sphaerulina leaf spot of clover, E. F. Hopkins (*Phytopathology, 13 (1923), No. 3, pp. 117–126, pls. 2, figs. 3; abs. in Phytopathology, 13 (1923), No. 1, p. 59*).—A clover leaf spot thought to be new to this country, though supposedly identical with that observed in Denmark by E. Rostrup in connec-

tion with a fungus described as new by him under the name *S. trifolii*,[3] is noted as having appeared in 1920 on the campus of the University of Missouri and as having been observed later at other points in Missouri, also in Illinois and New York. Though seen as yet principally on *Trifolium repens*, the disease has been noted also on *T. hybridum* and *T. pratense*, *T. pratense perenne* appearing very susceptible. Inoculations with cultures from lesions, also from single ascospores, show the organism to be pathogenic. Infections of seed may occur.

Corn root, stalk, and ear rot disease investigations in Kansas: Report of progress, 1922, L. E. MELCHERS and C. O. JOHNSTON (*Abs. in Phytopathology, 13 (1923), No. 1, p. 52*).—White corn varieties used showed an abundance of *Fusarium moniliforme* (on 95 per cent of all ears tested and externally on 50 per cent of the grains), with occasional traces of *Diplodia zeae* and less of *Gibberella saubinetii* on the germinator. More common than the last two named fungi are *Penicillium* sp., *Rhizopus* sp., and *Aspergillus* sp. The germinator occurrence of these fungi on Kansas corn is not considered at present a safe test for seed corn in Kansas.

Relation of environment to infection of corn seedlings by Diplodia zeae, H. JOHANN, J. G. DICKSON, and G. WINELAND (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 52, 53*).—Five series of experiments conducted in the Wisconsin temperature tanks indicate that *D. zeae* does not cause a destructive seedling blight of corn when healthy seed is inoculated with spores or mycelium and the seedlings are grown under favorable conditions. The fungus is capable of attacking the mesocotyl, especially under extremely high or low soil moisture conditions at temperatures ranging from 24° to 32° C., which includes the optimum temperature for its growth.

Fungous infection of seed corn kernels and the importance of germination tests, C. W. EDGERTON and A. F. KIDDER (*Louisiana Stas. Bul. 193 (1925), pp. 3–24, figs. 5*).—Of the four species of fungi commonly reported as occurring on corn kernels, the authors claim that *Fusarium saubinetii* has not been reported in Louisiana. *Diplodia zeae* is said to occur abundantly in Louisiana, but ears affected with this fungus are seldom used for seed purposes. It is claimed that about 50 per cent of the corn kernels used for seed in Louisiana are infected with *F. moniliforme* and about 30 per cent with *Cephalosporium acremonium*.

As a result of three years' tests it is considered that neither *F. moniliforme* nor *C. acremonium* has any marked effect on stand or yield in Louisiana. From one year's experiment, the fungus infection of grains appeared to have no effect on the suckering of the plant, nor did the presence of suckers seem to have any effect on the yield of individual plants.

The authors claim that laboratory germination tests are not a good index of the performance of corn in Louisiana. Better stands in the field, and consequently higher yields, were obtained with corn that showed well in the germination tests, but the individual plants did not produce any better than plants from corn that showed poor germination tests. A single year's test is said to have shown that smooth ears give better stands and higher individual yields than rough-dent ears.

Diseases in Illinois seed corn as found in the Fifth Utility Corn Show, B. KOEHLER and N. A. PETTINGER (*Illinois Sta. Circ. 299 (1925), pp. 8, figs. 4*).—From a study of several hundred samples of corn exhibited at this corn show, held at Urbana in January, 1925, the authors have devised a score card based on the quality of the grain rather than on uniformity of ears.

[3] Bot. Tidsskr., 22 (1899), No. 3, p. 265

Infection by scutellum rot, *Diplodia zeae*, *Gibberella saubinetii*, *Fusarium moniliforme*, and *Cephalosporium acremonium* was found to occur in average percentages ranging from 0.44 to 35 in different samples. In some lots high percentages of dead kernels were found that are attributed to *D. zeae*. It is believed that a close relationship exists between infection with scutellum rot and a soft starchy endosperm, and that selection of horny kernels will therefore lessen the amount of infection with this disease. Diplodia infection was found to occur more frequently in yellow corn than in white in samples from all three sections of the State. The horny endosperm did not seem to offer any protection against this disease.

The cottony leak of cucumbers caused by Pythium aphanidermatum, C. Drechsler (*Jour. Agr. Research [U. S.], 30 (1925), No. 11, pp. 1035–1042, pls. 2, fig. 1*).—A description is given of a cottony leak of cucumbers which has been found occasionally on cucumbers grown in the Southeastern States and shipped to northern markets. The disease is said to be caused by *P. aphanidermatum*, and the same fungus is said to be strongly parasitic on watermelons, causing some of the blossom-end rots. Squashes of several types were readily inoculated with the fungus.

For the control of this disease, the sorting of the cucumbers harboring the fungus and the lowering of humidity and temperature by providing adequate ventilation, combined with refrigeration where available, are recommended.

Disease of flax caused by a species of Rhizoctonia, W. E. Brentzel (*Abs. in Phytopathology, 13 (1923), No. 1, p. 53*).—A destructive and apparently undescribed flax wilting disease has been observed in eastern North Dakota, where areas up to 1 acre may show near 100 per cent infection of the roots just beneath the soil. The fungus, apparently a Rhizoctonia, appears nonpathogenic to other plants tested thus far. The minimum, optimum, and maximum temperatures are about 13, 26, and 35° C., respectively.

A disease of flax not previously reported in the United States, W. E. Brentzel (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 53, 54*).—A disease of seed flax observed during four years in North Dakota develops characteristic greenish yellow to dark brown mottling on the stems, leaves, and capsules. During the 1922 season, a like disease was observed on fiber flax in Michigan by R. L. Davis. This disease is similar to if not identical with that caused in South America by *Phlyctaenia linicola*. Artificial inoculations indicate that certain flax varieties are very susceptible, others somewhat resistant.

Intracellular bodies associated with a "mosaic" of Hippeastrum johnsonii, H. H. McKinney, S. H. Eckerson, and R. W. Webb (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 41, 42*).—Free-hand sections and embedded material from leaves of *H. johnsonii* showing a mosaic-like mottling revealed intracellular bodies which were usually associated with the host nuclei. The nature of these bodies, which are briefly discussed, and likewise their exact relation to the mosaic-like leaf mottling, is not known.

Black rot of kale, F. P. McWhorter (*Virginia Truck Sta. Bul. 49 (1924), pp. 359–363, figs. 3*).—A description is given of a black rot of kale due to *Bacterium campestre*. This disease is said to have been more or less apparent in the trucking regions of Virginia for several years, but in 1924 it became quite destructive. For its control the author recommends seed treatment with corrosive sublimate and rotation so that kale does not follow any other cruciferous plant.

Seed transmission of lettuce mosaic, A. G. Newhall (*Phytopathology, 13 (1923), No. 2, pp. 104–106*).—The tests and field observations here outlined seem to prove that lettuce mosaic is frequently transmitted through the seed, which appeared to be the most important source of primary inoculum in the spring.

An improved formaldehyde tank for the onion drill, A. V. OSMUN and P. J. ANDERSON (*Abs. in Phytopathology, 13 (1923), No. 1, p. 58*).—To the apparatus for applying formaldehyde to the furrow while planting onion seed in order to control onion smut, improvements have been made at the Massachusetts Experiment Station with the purpose of eliminating irregularity of application rate due to the speed of the operator and to the lowering of the level of the liquid in the tank. The main features of the improved equipment are, first, a tank made air-tight at the top by a screw cap, air to replace the liquid being admitted through a standpipe attached near the bottom which eliminates variation in rate of flow due to diminishing head, and, second, changeable disks with graded openings which fit into a union in the delivery pipe so as to regulate the size of the outflow stream to correspond with the rate at which the operator walks.

Seed treatment in the control of pepper diseases, B. B. HIGGINS (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 57, 58*).—A pepper seed disease problem is presented where seed are gathered on a commercial scale, and it has been found that the common leaf spot and fruit rot organisms (*Cercospora capsici*, *Bacterium* sp., *Gloeosporium* sp., *Colletotrichum* sp., *Macrosporium* sp., and *Phoma destructiva*) may be carried over from year to year. In treating the seed for planting, the best results have been obtained with copper sulfate solution. This is applied at a strength of 1: 80 for 5 minutes after the seed have been soaked in water from 6 to 24 hours and drained. The seed are then dusted with air-slaked lime and planted at once.

The Alternaria blight of potatoes in Bermuda, H. H. WHETZEL (*Phytopathology, 13 (1923), No. 2, pp. 100–103, fig. 1*).—The author describes a virulent attack of early blight on potatoes in Bermuda in which some of the usual symptoms of the disease were lacking.

Studies on the causes of stem-end discolorations of potato tubers in North Dakota, W. WENIGER (*Abs. in Phytopathology, 13 (1923), No. 1, p. 55*).—Cultural studies of stem-end discolored tubers (mostly Early Ohio) from nearly every potato-growing part of the State were made from tissues averaging 0.5 in. from the surface. Fusarium wilt was found in less than 50 per cent of the discolorations, many tubers yielding no parasitic organism from the discolored areas, while some gave the blackleg bacillus or both that and the wilt fungus. Neither by coloration nor by extent were these discoloring organisms distinguishable.

Dutch potato varieties resistant to wart disease and internal brown spot, J. [O.] BOTJES and H. M. QUANJER (*Abs. in Phytopathology, 13 (1923), No. 1, p. 54*).—Potato varieties were selectively bred during some years for resistance to leaf roll, mosaic, and other deterioration diseases, data being collected meanwhile on susceptibility to internal brown spot, on yields, and on other qualities. The stocks thus prepared, which were to be tested in the area where potato wart had invaded the Netherlands from German territory, included 33 Dutch, 7 German, 1 English, and 2 Swedish varieties. The varieties found to be wart-free included Favoriet, Triumph, Fonteyn, Kruisling, Lieuwe, and Pepo. To internal brown spot Favoriet is susceptible, Triumph is resistant, and three other desirable varieties are intermediate. Pepo is a starch (factory) potato.

Ito's potato variety Ekishirazu in New York, D. REDDICK (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 55, 56*).—The potato variety Ekishirazu, as tested at Ithaca, is said to grow luxuriantly in a cool house, producing large tubers, while in a warm house it grows poorly, producing many small tubers. In 1921 and 1922 its growth in the field corresponded to that above stated for

the warm house. Subjected repeatedly, both in and out of doors, to conditions extremely favorable to infection by *Phytophthora infestans*, it has shown only occasional small lesions, but conidiophores on leaves only once. The variety is, however, susceptible to mosaic. Under cool conditions much pollen is borne, and hybrids from trials with Rural Green Mountain and the blight resistant Evergreen have been secured.

"Giant hill" potatoes a dangerous source of seed, a new phase of spindle-tuber, A. H. Gilbert (*Vermont Sta. Bul. 245 (1925), pp. 3–16, figs. 6*).—The author states that potato growers are quite likely to save and use as seed the tubers from exceptionally large, thrifty-looking plants. This practice may become detrimental, as potato hills commonly called giant hills are apt to be abnormal and to produce abnormal tubers. The investigations reported have shown that such seed tubers are very generally made up of ill-formed, spindle-shaped tubers.

As a result of field and greenhouse observations covering a period of two years, the author concludes that giant hill is a degeneration disease causing certain symptoms in potato vines and resulting in the production of tubers of undesirable shapes for seed and market purposes. It is said to be similar to the disease known as spindle tuber in its effects upon tuber shape. The vines of giant hill plants when fully mature are taller and coarser than normal ones and are more spreading in their habit of growth. The leaves are upright and often somewhat rolled or rugose or wavy margined. The vines are later in blossoming and often remain green and upright after the healthy ones have gone down. The tubers are generally elongated and thickened, pointed at one or both ends, and frequently constricted at some point on the longer axis. They are usually provided with numerous eyes which are either flush with the surface or somewhat protuberant. In some instances the tubers are pointed and shortened at one end, giving them a triangular outline.

For the prevention of giant hill, the author recommends the selection of disease-free potatoes for planting, separation of the seed field as far as possible from other potato fields, and thorough roguing of the seed field throughout the growing season.

A discussion is given of potato degeneration diseases, as well as of greenhouse studies of indexed seed pieces of normal and infected tubers.

Spraying and dusting of potatoes in 1922 at Chatham, Michigan, J. E. Kotila and G. H. Coons (*Abs. in Phytopathology, 13 (1923), No. 1, pp. 54, 55*).—It is evident that Bordeaux mixture is a highly profitable application, far superior to Bordeaux-like dusts.

Hot water and hot air treatments of potatoes, F. M. Blodgett (*Abs. in Phytopathology, 13 (1923), No. 1, p. 55*).—The previous year's experiments (E. S. R., 50, p. 652), testing hot water treatments of Bliss potatoes for mosaic, were continued with Rural potatoes affected with leaf roll, and the results agree closely as regards killings in these two potato varieties. All potatoes surviving the treatment still carried leaf roll. Surface injury and decreased sprouting appeared on potatoes treated about half the time required for complete killing. Blackheart resulted at all temperatures between 40 and 100° C. in the time range just above that necessary for killing. Preliminary experiments with dilute solutions of mercuric chloride produced curves which are parallel to the preceding and slightly below it. All potatoes having white sprouts surviving hot-air treatments for mosaic showed that disease.

Helminthosporium disease of rice, G. O. Ocfemia (*Abs. in Phytopathology, 13 (1923), No. 1, p. 53*).—This rice disease (E. S. R., 50, p. 654) is to be distinguished from a disease of *Sesamum indicum* due to *H. sesameum*. Experimental data bearing on the relations between soil temperatures and rice Hel-

minthosporium disease production are outlined. The fungus (*H. oryzae*) produced symptoms of the disease in artificial inoculation on 31 species of 23 genera of grasses.

The ascigerous stage of the sweet potato black-rot fungus, J. A. Elliott (*Abs. in Phytopathology, 13 (1923), No. 1, p. 56*).—As regards the fungus hitherto known as *Sphaeronema fimbriatum* and described as having three forms of asexual spores, examination is claimed to have shown that the supposed pycnospores are ascospores, apparently liberated within the perithecium by early disintegration of the ascus. The taxonomic characters place the fungus in Ceratostomella, and the name *C. fimbriata* is proposed.

The relation of humidity to the infection of sweet potatoes by Rhizopus, J. I. Jaubitzen and L. L. Harter (*Abs. in Phytopathology, 13 (1923), No. 1, p. 56*).—Rhizopus infection of sweet potatoes halved with a knife was very small at a relative humidity of 94 to 98 per cent and a temperature of 22.5 to 24° C. Infection rose nearly to 100 per cent at a humidity of 72 to 84 per cent, but fell to about 20 per cent at 49 to 52 per cent saturation. At 12° the relation of humidity to infection was the same as at 22.5 to 25°, except that the range was narrower.

If potatoes subjected to humidities of 94 per cent at 22.5 to 25° are exposed to lower humidities, scarcely any infection occurs, but if potatoes subjected to humidities of 49 to 63 per cent are placed at the same humidities nearly all become infected. Apparently changes occur at the higher humidities which make the potatoes more resistant to Rhizopus. This resistance appears to have been located by experimentation in the outer cells of the cut surface.

Magnesium hunger or sand-drown (*North Carolina Sta. Bul. 247 (1925), p. 15*).—It is claimed that on certain types of sandy soils tobacco is subject to a disease which is commonly called sand-drown. The trouble is manifest by a more or less complete blanching of the leaves, which never ripen properly. The application of magnesium limestone in the drill at the rate of 1,000 lbs. per acre is said to prevent entirely losses from this source.

Controlling tobacco wildfire in the seed-bed, P. J. Anderson (*Abs. in Phytopathology, 13 (1923), No. 1, p. 59*).—On five successive crops of tobacco seedlings in the experiment station beds, wildfire was reduced, on an average, to not over 1 per cent by spraying the seed beds with a copper fungicide, the controls showing from 20 to 92 per cent of infection. Bordeaux mixture, copper lime dust, and commercial fungicides were about equally effective. Applications must be so timed as to keep the leaves covered at all times. Dusting is more expensive than spraying, but is more rapid and more popular with the growers.

A new blossom-end decay of watermelons caused by an undescribed species of Pythium, C. Drechsler (*Abs. in Phytopathology, 13 (1923), No. 1, p. 57*).—At the Arlington Experimental Farm, Va., in 1922, a field disease of watermelons, supposedly new, appeared with destructive violence. The presence is noted in all diseased plants of a fungus resembling closely *P. artotrogus* (with deviations which are noted), which fungus may enter by way of wounds or of lesions caused by other fungi. Pure culture inoculations under the rind produced the disease, which is distinguishable easily from that caused by *P. debaryanum*.

The distribution of the orange-rusts of Rubus, B. O. Dodge (*Phytopathology, 13 (1923), No. 2, pp. 61–74*).—A discussion is given of the long and short cycle forms of orange rusts, their geographic distribution, host species, etc. Attention is called to the rather frequent mistakes that have been made in the designation of the species of the host.

Relative susceptibility of some rutaceous plants to attack by the citrus-scab fungus, J. R. Winston, J. J. Bowman, and W. J. Bach (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 11, pp. 1087–1093*).—As a result of their investigations, the authors claim that the citrus scab fungus attacks a comparatively narrow range of plants in the family Rutaceae. Observations and inoculations have been made on 22 genera, 35 species, 71 varieties, and 47 hybrid combinations, representing 2 subfamilies, 2 tribes, and 4 subtribes of the family. Many citrus forms were found to be immune to attack by citrus scab, while the susceptible ones exhibited all grades of resistance.

Experiments with Paris daisy and rose to produce resistance to crown gall, N. A. Brown (*Phytopathology, 13* (*1923*), *No. 2, pp. 87–99, pls. 2, figs. 4*).—A detailed account is given of experiments which extended over several years to produce strains or varieties of Paris daisies and roses that should be resistant to crown gall. No permanent resistance to the crown gall organism was developed either in the Paris daisy or in rosebush seedlings derived from somewhat resistant varieties, though a supposedly temporary resistance was noted in the daisy cuttings in the middle of the first series and in one plant of the the three rose seedlings.

Comparative studies of* Pythium debaryanum *and two related species from geranium, H. Braun (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 11, pp. 1043–1062, pls. 8, figs. 3*).—In a previous publication (E. S. R., 52, p. 749) the author described a disease of cultivated geraniums (*Pelargonium* sp.) caused by *P. complectens*. In this study mention was made of three other forms of Pythium which cause stem rots of geranium cuttings.

In the present paper the author describes stem rots of geraniums caused by *P. debaryanum*, *P. debaryanum pelargonii* n. var., and *P. splendens* n. sp., and gives detailed accounts of the comparative morphology and physiology of the different organisms.

Technical descriptions are given of the new species and the new variety.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Animal pests, A. de La Rue (*Les Animaux Nuisibles. Paris: Firmin-Didot & Co., 7. ed., pp. [3]+309, pls. 30, figs. 47*).—This handbook discusses the habits of mammal and avian pests and means for their control.

Farmers' foes in New Zealand and how to cope with them, F. W. Hilgendorf (*Auckland: Whitcombe & Tombs, Ltd.,* [*1924*], *pp. 82, figs. 27*).—This is a practical account of many of the more important insect and related enemies of the farmer in New Zealand.

Internal metazoan parasites collected from ruminants in the Philippine Islands, B. Schwartz (*Philippine Jour. Sci., 26* (*1925*), *No. 4, pp. 521–533, pls. 2*).—In this paper the author brings together all the previously published records and a comparatively large number of new records of parasites of Philippine ruminants. In the summary these species of parasites are listed according to their hosts. A list of 10 references to the literature cited is included.

Key-catalogue of the Protozoa reported for man, C. W. Stiles and A. Hassall (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 140* (*1925*), *pp. IV+67*).—This paper represents part 1 of the authors' Host Catalogue, Index Catalogue of Medical and Veterinary Zoology.

The Yorkshire canary, C. A. House (*London: Cage Birds, pp. 83+[3], pls. 4, figs. 2*).—A practical manual on this canary.

The bird as a diver, J. M. Dewar (*London: H. F. & G. Witherby, 1924, pp. XII+173*).—This is a contribution to the natural history of diving birds.

Homes for birds, E. R. KALMBACH and W. L. MCATEE (*U. S. Dept. Agr., Farmers' Bul. 1456 (1925), pp. II+22, figs. 11*).—This supersedes Farmers' Bulletin 609, previously noted (E. S. R., 31, p. 751).

Symbiosis in animals and plants.—II, Symbiosis in animals, G. H. F. NUTTALL (*Brit. Assoc. Adv. Sci. Rpt. 91 (1923), pp. 203–212*).—This includes a discussion of symbiosis in insects (pp. 206–209).

Hydrogen ion concentrations in the blood of insects, R. W. GLASER (*Jour. Gen. Physiol., 7 (1925), No. 5, pp. 599–602*).—This is a contribution from the department of animal pathology of the Rockefeller Institute for Medical Research. The author finds that "the range of pH values for the blood of grasshoppers and house flies is 7.2 to 7.6. The range of values for roaches is 7.5 to 8.0. The range for *Malacosoma americanum* is 6.4 to 7.4, and the range for *Bombyx mori* is 6.4 to 7.2. From the work of other investigators and from the writer's results it is apparent that the pH of insect blood, in general, may vary between 6.4 and 8.0. In the forms observed no correlation exists between blood pH and age, nor between pH and metamorphosis."

Records and problems of insect migration, C. B. WILLIAMS (*Ent. Soc. London, Trans., 1923, pt. 1–2, pp. 207–233, figs. 3*).—This discussion includes notes on the migration of 10 species and deals with the problems connected with migration, including a critical examination of some of the theories that have been put forward. It is pointed out that the question of direction of migration still remains unsettled.

[**Economic insects and their control**] (*Peninsula Hort. Soc. [Del.] Trans., 36 (1923), pp. 15–21, 24–31, 42–46, 73–76, 92–100, fig. 1*).—Papers presented at the annual meeting of the Peninsula Horticultural Society held at Dover, Del., in November, 1922, include the following: The Maintenance of a Spray Coating on Fruit and Foliage of Apples as a Means of Controlling Curculio and Codling Moth Where the Latter is Particularly Abundant, and the Present Status of Nicotine Dusts, by T. J. Headlee (pp. 15–21); Spray Injury, by J. F. Adams (pp. 24–31); The Control of Insects in 1922 (pp. 42–46) and Relation of Bees to Production of Fruits and Vegetables (pp. 73–76), both by E. N. Cory; and Improving Our Orchard Sprays with a Fixative, by J. F. Adams (pp. 92–100).

[**Economic insects of Florida and their control**] (*Citrus Indus., 6 (1925), No. 4, pp. 8, 10, 14–22, 27–29, 32, 36, 38, figs. 17*).—Papers here presented include Spraying and Dusting for Control of Insects and Mites on Citrus, by W. W. Yothers (pp. 8, 38); Use and Abuse of Dust Method for Grove Pest Control, by H. W. Dye (p. 10); Injury to Orchard Trees by Termites or "White Ants," by T. E. Snyder (pp. 14–17, 36); The New Citrus Aphid, by J. R. Watson (pp. 18, 19, 32); The Story of an Insect Pest [citrus white fly and *Aleyrodes nubifera*], by E. W. Berger (pp. 20–22, 36); and Controlling the New Aphis with Calcium Cyanide, by R. W. Kelley (pp. 27–29).

[**Report of the**] **provincial entomologist**, G. MAHEUX (*Quebec Min. Agr. Rpt. 1923–24, pp. 224–233, pl. 1, fig. 1*).—A brief report is given by the entomologist of Quebec for the year 1923–24. It is stated that in one parish 20,000 egg clusters of the eastern tent caterpillar, representing over 6,000,000 caterpillars, were gathered by boys and girls in a few weeks from branches of fruit and ornamental trees.

Economic notes, E. O. ESSIG (*Pan-Pacific Ent., 1 (1925), No. 3, pp. 142, 143*).—These notes include the report, by V. Duran, of An Outbreak of *Telea polyphemus* Cram. near San Jose, Calif., where a double row of large elms was completely defoliated; a note by E. W. Rust on A Predacious Helix in South Africa, which climbs plants in Cape Town and eats off the white wax scale (*Ceroplastes destructor*); a note by E. C. Van Dyke on Mating Habits of

Polistes; and observations by H. H. Keifer on the large Pandora moth, *Coloradia pandora*, in Oregon.

The pests of agriculture observed in Pulawy, Poland, and its surroundings in 1923 [trans. title], J. Woroniecka (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polon. Écon. Rurale Pulawy*), *4* (*1923*), *A*, *pp. 341–359*).—This is an account of the more important insect pests of the year.

Insects affecting stems of wheat and other small grains in North Dakota, R. L. Webster (*North Dakota Sta. Circ. 25* (*1925*), *pp. 3–20, figs. 22*).—This is a practical summary of information. Insects feeding within the stem include the wheat-stem maggot, frit flies (*Oscinis frit* L.), and the western wheat-stem sawfly (*Cephus cinctus* Nor.) at the base of the plant; the stalk borer and wheat-stem sawfly boring through the joints; and the wheat-stem maggot above the topmost joint. Insects feeding outside the stem (in the sheath) include the Hessian fly and frit flies at the base of the plant and the Hessian fly above the joints.

[**Insect enemies of the rice plant in Chekiang Province, China**] (*China Natl. Bur. Ent. Pop. Buls. 1* (*1924*), *folio, fig. 1; 2, pp. 16, fig. 1; 3, pp. 22, figs. 2; 4, pp. 10, fig. 1; 5* (*1924*), *pp. 14, pl. 1, fig. 1*).—The loss of rice due to insect attack in Chekiang Province, which reached 40 per cent, resulted in the establishment in 1924 of the National Bureau of Entomology at Kashing, Chekiang, by the provincial government of Chekiang. The work conducted was followed by an increase in 1924 of 30 per cent in the harvest as compared with previous years. These popular bulletins, which are in Chinese, deal with the subject as follows:

No. 1. *A calendar for control of paddy borers* (*Schoenobius incertellus* Wlk.), K. Y. Fey and L. N. Wong.—Monthly control measures for one of the most serious enemies of rice in China are presented in descriptive chart form.

No. 2. *Destruction of the eggs of paddy borers* (*Pyralidae, Lepidop.*), A. V. Chu and K. Y. Fey.—The paddy borers *S. incertellus* and *Chilo simplex* Butl. are said to be effectively combated by the collection of egg clusters, the former three times and the latter twice a year.

No. 3. *Suggestion for control of the moths of paddy borers*, A. V. Chu.—The measures for controlling paddy-borer moths are brought together under the headings of natural enemies, use of the net, and trapping by lanterns.

No. 4. *The Naranga diffusa Wlk. as a pest of rice* (*Noctuidae*).—This noctuid appears in the western part of the Province, often in numbers estimated at 30,000 per acre. Of 483 larvae observed, 122 were killed by hymenopteran parasites, including two braconids and one chalcidid, and 12 were killed by a fungus disease.

No. 5. *Delphax infesting rice at Chekiang* (*Fulgoridae, Homop.*), K. Y. Fey.—Fulgorids of the genus Delphax are the source of much damage to the rice plant. Petroleum emulsion is used to combat them.

Sugar cane entomology, O. H. Swezey (*Planter and Sugar Manfr., 74* (*1925*), *No. 13, p. 251*).—This is an entomological digest of the proceedings of the first conference of the International Society of Sugar Cane Technologists.

Notes on Queensland cane insects and their control (second series), E. Jarvis (*Queensland Bur. Sugar Expt. Stas., Div. Ent. Bul. 18* (*1925*), *pp. 64, figs. 44*).—This compilation of notes on cane insects is in continuation of the series previously noted (E. S. R., 51, p. 659).

Injurious shade tree insects of the Canadian prairies, J. J. de Gryse (*Canada Dept. Agr. Pamphlet 47, n. ser.* (*1924*), *pp. 23, figs. 22*).—This is a summary of information on the more important shade tree insects of the Canadian prairies.

Destruction of the migratory grasshopper [trans. title] (*Bol. Agr. Indus. y Com. Guatemala, 4 (1925), No. 1, pp. 8–23*).—A brief account of the migratory grasshopper in Guatemala, with an extended discussion of means for its control.

Notes on some little known thrips (Thysanoptera), G. W. Herrick (*Ent. News, 36 (1925), No. 6, pp. 180–183, figs. 2*).—A thrips causing some injury to *Lilium canadense* in the New York Botanical Garden has been identified as *Liothrips vaneeckei* Psnr., which attacks the bulbs of *Lilium pardalinum* in the Netherlands. A species close to *Liothrips umbripennis* Hood was found causing galls on the foliage of *Cornus stolonifera*.

The elm-currant aphis (Eriosoma ulmi L.), R. Glendenning (*Ent. Soc. Brit. Columbia, Proc., No. 21 (1924), pp. 33–40, figs. 12*).—A brief account of this aphid, its life history, economic importance, and control.

Control of some scale insects infesting Colorado trees and shrubs, C. P. Gillette and G. S. Langford (*Colo. State Ent. Circ. 46 (1925), pp. 14, figs. 8*).—This is a brief practical account of some of the more important scale insects of trees and shrubs in Colorado.

The influence of meteorological conditions on the life-cycle of the Mysore lac insect, M. Sreenivasaya and M. Basappa (*Jour. Indian Inst. Sci., 7 (1924), No. 15, pp. 285–291*).—This is an account presented in connection with tabular data which show that the life cycle of the lac insect is mainly influenced by temperature. A brief account of The Significance of the Constituents of Some Stick-lacs, by C. R. Somayajulu, follows.

An enumeration of the butterflies and moths from Saghalien, with descriptions of new species and subspecies, S. Matsumura (*Jour. Col. Agr. Hokkaido Imp. Univ., 15 (1925), No. 3, pp. 83–196, pls. 4*).—The author lists 485 forms of Lepidoptera occurring in Sakhalin, erects several new genera, and describes new species and subspecies.

The tent caterpillar, F. J. Seaver (*Jour. N. Y. Bot. Gard., 26 (1925), No. 304, pp. 73–77, fig. 1*).—This includes a statement by J. G. Curtis as to the systematic destruction of tent caterpillar egg masses by school children of Westchester County, N. Y.

Controlling codling moth in walnuts, J. Klein (*Calif. Cult., 64 (1925), No. 21, pp. 583, 587, fig. 1*).—It is pointed out that both dusting and spraying have been used as means of control of the codling moth in walnuts, with practically identical results. During 1924, 2,700 acres in the Whittier district of Los Angeles County were sprayed, a few receiving two applications. Inspection in the fall in one section showed an average of 7.1 per cent of damaged nuts in 17 groves sprayed once. In 8 groves sprayed twice because the infestation was very bad 5.5 per cent of the nuts were damaged. In 4 groves that were not treated the damage was 22.2 per cent. In another section 20 groves sprayed once showed a loss of 4.2 per cent, while in an unsprayed grove the loss was 12 per cent. It is estimated that the average cost of spraying is equal to about 4 per cent of the normal crop. The formula used consists of 16 lbs. of lead arsenate, 1 pint of nicotine sulfate, and 4 lbs. of spreader in 400 gal. of water. The spray was pumped from the tank at 400 lbs. pressure and reached the top of 60- and 70-ft. trees. Since the eggs are all laid upon the young nuts, it is necessary to spray the inside of the tree to cover the inside nuts.

On the 2,700 acres sprayed in 1924 it took an average of 27 gal. to the tree, at a cost of about 50 cts. a tree, though the association sprayers, of which there were seven in operation, did the work of 25.6 cts. a tree for labor and material, and the association bore the overhead and maintenance of the machines.

[**Oriental peach moth control**] (*Penn. Farmer, 91 (1925), No. 24, pp. 3, 21, 22*).—This is a discussion of the attraction of the oriental peach moth to light, in which it is pointed out by L. A. Stearns that the moths are not attracted by electric lights.

Leaf-rollers attacking orchard trees in the Okanogan Valley, E. P. VENABLES (*Ent. Soc. Brit. Columbia, Proc., No. 21 (1924), pp. 22–27*).—The pests considered include the fruit-tree leaf-roller, the rose leaf-tyer, *Tortrix alleniana* Fern., and *Peronea maximana* B. & B.

The purple leaf moth of coconuts in Fiji (Levuana iridescens Bethune-Baker), C. H. KNOWLES (*Fiji Dept. Agr. Bul. 15 (1924), pp. 14, fig. 1*).—This is an account of an important enemy of the coconut in Fiji.

Some observations and experiments on the irritating properties of the larva of Parasa hilarata Staudinger, R. G. MILLS (*Amer. Jour. Hyg., 5 (1925), No. 3, pp. 342–363, figs. 11*).—This is a report of studies of the intense irritating properties of the larvae of a lepidopteran which occurs in Peking and its environs in north China. The slightest contact with the larvae is said to be sufficient to produce extensive lesions, which usually last several days.

"Injury is due to the mechanical introduction of a toxic substance by contact with any of the sharp-pointed spines widely distributed over its body. It is apparently not necessary for a portion of the spine to remain in the skin. The so-called 'nettling hairs' are of very little importance. The toxic substance is contained within the spines, probably closely connected with the protoplasm, and has not been separated therefrom. It was destroyed or inactivated by almost every procedure employed, the chief exceptions being water, formalin 5 per cent, and sodium hydrate 1 per cent."

Observations bearing on the habits and life history of the species are described. Fourteen references to the literature are appended.

The toxic action of oil films upon mosquito larvae with particular reference to pine oil films, M. E. BARNES (*Amer. Jour. Hyg., 5 (1925), No. 3, pp. 315–329*).—The author finds that "pine oil has a powerful soporific or paralyzing effect upon mosquito larvae and pupae, and in effective doses results in their death either directly or, apparently, by drowning while under the effects of the drug. Anopheline and culicine larvae are able to withstand prolonged submersion in water. Anopheline and culicine larvae in many cases may be resuscitated after prolonged submersion, even after being in contact with oil films. A method of resuscitating supposedly drowned larvae is described. Crude oil is an efficient and economical vehicle for carrying pine oil to larvae by means of film dosage. A mixture of crude oil and pine oil in the proportions of nine parts of the former to one of the latter produces a better film than either ingredient and one which is highly effective in destroying all stages of anopheline and culicine larvae and pupae. The ova of *Anopheles quadrimaculatus* Say are partially resistant to pine oil acting through films.

Summary of experiments with fishes and certain chemicals in destroying mosquito larvae [trans. title], A. REYNE (*Dept. Landb. Nijv. en Handel Suriname Bul. 47 (1924), pp. 54*).—This is a report of studies conducted in Paramaribo, Dutch Guiana.

Provisional list and reference catalogue of the Anophelini, S. R. CHRISTOPHERS (*Indian Med. Research Mem. 3 (1924), pp. 105*).—In part 1 a brief introduction is followed by an index of names of higher value than species (p. 7), an index of specific and varietal names (pp. 9–13), and a systematic list of species (pp. 15–76). Part 2 consists of a descriptive synopsis of the subgenera (pp. 77, 78) and of the species (pp. 78–105).

A review of the species of Culicoides of North and Central America and the West Indies, W. A. HOFFMAN (*Amer. Jour. Hyg., 5 (1925), No. 3, pp. 274–301, pls. 2, fig. 1*).—This is a review of the species of a genus of Diptera, of importance because of their attack upon both man and animals.

A note on a simple method of breeding sandflies, R. O. A. SMITH (*Indian Jour. Med. Research, 12 (1925), No. 4, pp. 741, 742, pls. 2*).—An illustrated account of methods employed by the author at the Calcutta School of Tropical Medicine.

Key to gall midges, E. P. FELT (*N. Y. State Mus. Bul. 257 (1925), pp. 239, pls. 8, figs. 57*).—This eighth part consists of a résumé of Studies I–VII of the Itonididae which have been noted from the reports of the New York State entomologist (E. S. R., 41, p. 159; 47, p. 550). It presents the more striking and important facts concerning these insects from the economic, biologic, and systematic aspects, and through the key to genera and the extensive bibliography makes it relatively easy to look up the much scattered literature of a large group. An index to Parts I–VII and a separate index to Part VIII are included.

Observations on the appearance of the Hessian fly in Pulawy, Poland, and its surroundings in 1923 [trans. title], J. WORONIECKA (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 4 (1923), A, pp. 360–368*).—An account of the occurrence and economic importance of the Hessian fly in Pulawy. Only a few parasites were observed, which were probably *Trichacis remulus* Wlk.

The apple maggot, T. L. GUYTON and J. N. KNULL (*Penn. Dept. Agr. Circ. 1 (1925), pp. 8, figs. 5*).—This is a practical summary of information.

White grubs, Lachnosterna sp., and larvae of the weevil root-borer, Diaprepes spengleri L., attacking sugar cane in the Guanica district of Porto Rico, and methods practised for controlling them, E. H. BARROW (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 2, pp. 22–26*).—A discussion of the attack of sugar cane by this pest and the control methods practiced.

The pin-hole borer (Atractocerus kreuslerae Pasc.), J. CLARK (*Jour. Dept. Agr. West. Aust., 2. ser., 2 (1925), No. 1, pp. 138–142, figs. 7*).—This is an account of a borer which probably causes greater damage to the commercial timber growing in Western Australia than any other insect.

On the larval mines of some Orchestini [trans. title], R. KLEINE (*Ztschr. Wiss. Insektenbiol., 19 (1924), Nos. 9, pp. 203–207, figs. 43; 10, pp. 251–254; 20 (1925), Nos. 2, pp. 24–27; 3, pp. 44–53*).—An account of the leaf mines of larvae of 10 species of weevils of this group, particularly of *Orchestes fagi* L.

Disinfectants for European and American foulbrood, B. A. SLOCUM (*Wash. State Col. Ext. Bul. 128 (1925), pp. 10, figs. 4*).—This is an account of Hutzelman's alcohol-formalin solution and the sodium hypochlorites.

The queen bee, W. WANKLER (*Die Königin. Freiburg i. Br.: Theodor Fisher, 1924, 4. ed., rev. and enl., pp. VII+122, pl. 1, figs. 49; rev. in Bee World, 5 (1924), No. 12, p. 192*).—This is a fourth revised and enlarged edition of the work, first published in 1903, which gives a description of the principles underlying queen rearing.

Erlangen yearbooks of apiculture, 1923 and 1924 [trans. title], edited by E. ZANDER (*Erlanger Jahrb. Bienenk., 1 (1923), pp. 166, figs. 41; 2 (1924), pp. 189, figs. 18*).—The papers presented in the 1923 yearbook include the following: A Contribution on the Variability and Inheritance in the Honeybee, by E. Zander (pp. 5–66); Inheritance and Breeding: Theory and Practice, by G. R. von Ebert (pp. 67–108); Report on the Work of the Apiculture Station at Erlangen in 1922, by E. Zander (pp. 109–153); and Progress in the Field of Anatomy and Biology of Bees, by A. Himmer (pp. 154–166).

The papers presented in the 1924 yearbook include the following: The Importance of Bees in the Pollination of Our Useful Plants, by E. Zander (pp. 5–85); The Government and Bee Breeding, by G. R. von Ebert (pp. 86–102); Report on the Work of the Apiculture Station at Erlangen in 1923, by E. Zander (pp. 103–147); Progress in the Field of Anatomy and Biology of Bees, by A. Himmer (pp. 148–175); and The Cocoon of the Honeybee, by H. Prell (pp. 176–189).

The life of ants, R. BRUN (*Das Leben der Ameisen. Leipzig: B. G. Teubner, 1924, pp. 211, figs. 60*).—An account of the life history, bionomics, etc.

A revision of the parasitic wasps of the genus Microbracon occurring in America north of Mexico, C. F. W. MUESEBECK (*U. S. Natl. Mus. Proc., 67 (1925), Art. 8, pp. 85, pls. 2*).—This revision of the genus Microbracon includes descriptions of 15 new species.

Notes on the status of some parasitic Hymenoptera in south India, T. V. RAMAKRISHNA AIYAR (*Jour. Bombay Nat. Hist. Soc., 30 (1925), No. 2, pp. 487–491, pls. 3, fig. 1*).—The importance of the parasitic Hymenoptera in south India is discussed.

Prospaltella as an egg parasite of the codling moth, S. E. FLANDERS (*Pan-Pacific Ent., 1 (1925), No. 4, pp. 188, 189*).—The author reports briefly upon the results of a weekly census of the codling moth on permanent check trees throughout 3,000 acres of walnut orchards made by the pest-control department of the Saticoy Walnut Growers' Association in Ventura County, Calif. Daily observation was made by D. Burk of oviposition on six trees at the center of infestation, which resulted in the finding of 1,297 eggs on the nuts, of which 665 were followed from the time of deposition to hatching. The incubation period averaged 12.5 days. The presence of the parasite was detected even before the eggshell turned black—an indication that the parasite is in the pupal stage. The nuts carrying the infested eggs were taken to the laboratory and kept under close observation. Forty-one parasitized eggs are recorded as having been collected on dates from May 30 to July 25.

Apple tree woolly aphis and its subjugation by Aphelinus mali (Hald.), H. JARVIS (*Queensland Agr. Jour., 23 (1925), No. 4, pp. 314–316*).—A brief report on this parasite of the woolly apple aphid and its importance in Queensland.

Description of a new sawfly injurious to jack pine, S. A. ROHWER (*Ent. Soc. Wash. Proc., 27 (1925), No. 5, pp. 115, 116*).—Under the name *Neodiprion* (*Neodiprion*) *banksianae*, the author describes a new sawfly reared by S. A. Graham from larvae feeding on *Pinus banksiana* in Itasca Park and Osage, Minn.

The pine needle mite, E. WALTHER (*Pan-Pacific Ent., 1 (1925), No. 4, p. 190*).—A brief note is presented on *Eriophyes pini* Nal., which is again becoming conspicuous in Golden Gate Park, San Francisco, on Monterey pine (*Pinus radiata*). At present the only method of control promising to be effective is the destruction of the affected trees.

FOODS—HUMAN NUTRITION

The influence of storage on the composition of flour, J. E. GREAVES and C. T. HIRST (*Utah Sta. Bul. 194 (1925), pp. 3–20, figs. 8*).—Thirteen samples of flour of different grades milled from new wheat were stored in cases with glass doors and analyzed at the beginning of the experiment and at the end of one, two, and four years, for moisture, phosphorus (total, water-soluble, and alcohol-soluble), H-ion concentration, soluble carbohydrates, and water-soluble amino acids. The moisture determinations were made by drying 5-gm. samples

to constant weight in a Freas electric oven at 100° C. The H-ion concentrations were determined with the potentiometer in the water extract of the flour. The Munson and Walker modification of the Bertrand method was used for the soluble carbohydrates and the Sörensen method for the soluble amino acids.

The moisture content of the various flours tended to reach a constant value of about 8 per cent, corresponding closely to the figure previously reported for wheat in the same locality (E. S. R., 30, p. 460).

As judged by a comparison of the ash content of the various flours and of the wheat from which they were milled, the milling removed 70 per cent of the ash, 63 of the phosphorus, 90 of the calcium, and 79 per cent of the magnesium. This changed the ratio of calcium to phosphorus from 1:2.2 to 1:3.8. The flours differed markedly in their content of total ash and of phosphorus, calcium, and magnesium. During storage the water-soluble phosphorus increased and the alcohol-soluble phosphorus decreased. It is estimated that 40 per cent of the increase in water-soluble phosphorus came from the phospholipins and the rest from phosphoproteins and nucleoproteins, chiefly the former.

The H-ion concentration in every case decreased at first and then increased. The preliminary decrease is attributed to a continuation of the ripening period and the following increase to deterioration, since only the inferior flours showed marked increase in H-ion concentration.

As far as could be judged by the Sörensen titration method no evidence was obtained of protein cleavage during storage. There was in all cases a very slight decrease in the water-soluble amino acids with increase in the time of storage. The percentage of the total nitrogen of the flour occurring as water-soluble basic nitrogen varied between 1.39 and 3.52 per cent.

There was a wide variation in the water-soluble reducing carbohydrates in the various flours, but in nearly all cases there was a tendency toward an increase in amount during storage, thus indicating diastatic action.

Somewhat irregular results were obtained in moisture absorption and loaf volume tests after different periods of storage, but the authors conclude that "the water-absorbing powers of all the flour increased as did also the flavor and texture of the highly milled flours during storage. Storage increased the bread-making properties of flour. The time necessary for optimum benefit to result depends upon the flour."

Physical factors in predicting the basal metabolism of girls, F. G. Benedict (*Amer. Phil. Soc. Proc., 63 (1924), No. 1, pp. 25–56, figs. 3*).—This paper, which should be consulted in the original, deals with various studies on the basal metabolism of girls in an effort to determine the most important factors in the prediction of metabolism in this class of subjects. The studies considered in special detail are those of Benedict and Talbot on metabolism and growth from birth to puberty (E. S. R., 45, p. 561), of Benedict and Hendry on the metabolism of girl scouts (E. S. R., 47, p. 364), of Bedale on the metabolism of English boarding school children (E. S. R., 49, p. 762), and on unpublished studies by Blunt on the metabolism of girls from 8 to 18 years of age and by MacLeod on the metabolism of girls from 10 to 15 years of age. The general conclusions drawn from the comparison of the data reported are summarized as follows:

"Based upon an analysis of the Nutrition Laboratory series of measurements of infants, young children, girl scouts, and adult women, it is found that a most important factor correlating with basal metabolism measurements is height. The importance of introducing some index of the state of nutrition, such as Pirquet's pelidisi, and the fact that the total 24-hour basal heat production

divided by the pelidisi referred to height shows a straight line relationship from 3 months to adult life further justifies the emphasis laid upon the height element in basal metabolism predictions. For newborn infants, both males and females, from 1½ to 6 days old it is recommended that the formula involving length, previously published by Benedict and Talbot, be employed in predicting the metabolism. For girls from 1 week to 12 years of age a new method of prediction involving height alone is recommended. From 12 to 20 years of age the metabolism of girls may at present be best predicted from the curve based upon a series of experiments with girl scouts, showing the heat production per kilogram of body weight per 24 hours referred to age. For adult women 21 years and over the formula of Harris and Benedict for women, involving age, weight, and height, is retained."

The maximum of human power and its fuel, Y. Henderson and H. W. Haggard (*Amer. Jour. Physiol., 72 (1925), No. 2, pp. 264–282, fig. 1*).—In this paper data are presented on the respiratory quotient and development of power during rowing an 8-oared racing shell in five members of the Yale University crew, winners of the Olympic championship, Paris, 1924, and in three oarsmen of other crews. The energy expenditure was determined by three methods: (1) By the drawbar pull and speed when boat and crew were towed by a motor boat, (2) by means of a specially constructed rowing machine in the laboratory, and (3) by determinations of the oxygen consumption by the oarsmen.

The results obtained by these methods agreed satisfactorily, and indicated that the maximal power exerted in such exercise is from 0.45 to 0.57 horsepower per man, or, expressed in calories, 4.8 to 6 calories per minute, with a total energy expenditure of 19 to 30 calories per minute, equivalent to from 13 to 20 times the basal rate. The lower figures represent the maximum power maintained for 22 minutes during a 4-mile race and the highest figures the maximum that can be maintained for about 6 minutes in races of about 1⅛ miles. Corresponding figures for the volume of oxygen consumed per minute were 3.5 and 4 liters.

Determinations on the respiratory quotients showed that fat and sugar were burned in nearly the same proportion during the exercise as before, and that sugar is, therefore, not the sole fuel for muscular energy. It is thought, however, that it would be distinctly helpful to raise the respiratory quotient by providing ample sugar from a half to three-quarters of an hour before any prolonged contest.

Further observations on nutrition with diets rich in protein, V. B. Reader and J. C. Drummond (*Jour. Physiol., 59 (1925), No. 6, pp. 472–478, figs. 3*).—On account of the discrepancies in the results obtained by Drummond, Crowden, and Hill (E. S. R., 48, p. 860), Polvogt, McCollum, and Simmonds (E. S. R., 50, p. 162), and Osborne and Mendel (E. S. R., 51, p. 557) in similar studies on the influence of diets rich in protein on growth and nutrition, the authors have conducted a further series of feeding experiments on young rats weighing about 50 gm. at the beginning of the experiment. The diets used contained 20, 45, and 90 parts of caseinogen and 70, 45, and 0 parts of starch, respectively, with cod liver oil 2, yeast extract 5, lemon juice 5, and salt mixture 5 parts. Typical growth curves of males and females on the three diets are given, showing normal growth in the first group on the ration furnishing 20 per cent of protein, growth normal at first but later retarded in the second group, and subnormal growth becoming stationary at about one-third the calculated normal weight in the third group. The daily consumption of food increased with increasing amounts of protein. Reproduction was normal in

the first group, group 2 produced a few litters, and there was no reproduction in group 3.

In a number of animals killed after about 4 months, the organs appeared to be normal with the exception that the kidneys showed increasing hypertrophy with increased protein.

No explanation is advanced concerning the failure to grow on the high protein diet, although the theory of Hartwell of a relation between vitamin B and protein is considered worthy of further study (E. S. R., 52, p. 364).

Vitamin potency of cod-liver oils, IX–XI, A. D. Holmes (*Indus. and Engin. Chem., 16 (1924), Nos. 9, pp. 964, 965, figs. 3; 11, pp. 1181–1184, figs. 9; 17 (1925), No. 1, pp. 75–78, figs. 5*).—A continuation of the studies previously noted (E. S. R., 51, p. 864).

IX. *Oil produced by the rotting process.*—A comparison was made according to the usual technique of the content of fat-soluble vitamins in pollock liver oil prepared from fresh livers with that prepared from livers which had rotted for 4 months and 8 months, respectively. Of the freshly rendered oil, 0.21 mg. daily proved sufficient to maintain body weight of the rat given this dose. The other six animals of the series, which received from 0.42 to 2.42 mg. of oil daily, grew rapidly. Approximately three times as much of the oil from the livers rotted 4 months was required to produce the same growth as with freshly rendered oil. Of the oil from livers rotted 8 months as large an amount as 6 mg. daily proved insufficient as a source of fat-soluble vitamin. It is concluded that fish liver oils produced by the rotting process have a much lower content of vitamin A than oils produced from fresh livers.

X. *Medicinal cod-liver oils.*—Data are reported on the vitamin A content of 10 lots of Norwegian medicinal cod liver oil purchased in the open market. For purposes of comparison, the physical and chemical constants of the oil were also determined. As judged by the usual tests, the amount of oil necessary to supply sufficient vitamin A to enable rats to live for the usual 45-day experimental period varied from 0.715 to 18.15 mg. per day. Although the oils differed markedly in chemical constants, particularly in the acid value which varied from 0.514 to 2.311 per cent, the differences could not be correlated with the vitamin potency of the oil. It is of interest that all samples of oil bearing a statement concerning the vitamin potency had a higher potency than was guaranteed.

XI. *Butter fats produced on summer feeds.*—The butterfat from the milk of 7 cows from different breeds was tested for vitamin A by the methods employed in the cod-liver oil studies. While comparisons of the vitamin potency of the fat of the milk of the different breeds of cattle are not possible from the data reported on account of differences in age, feeding, period of lactation, and number of lactations, the results indicate that as little as 51.7 mg. per day of butterfat produced on summer feeds furnishes sufficient vitamin A for the needs of young rats. This amount is about 100 times that required of first quality cod liver oils.

Vitamin potency of cod-liver oils—XIII, Vitamin A potency of dogfish liver oil, A. D. Holmes and M. G. Pigott (*Indus. and Engin. Chem., 17 (1925), No. 3, pp. 310, 311, fig. 1*).—Analyses of dogfish liver oil and determinations of its content of vitamin A are reported, with the following results: Specific gravity at 25° C. 0.9153, refractive index at 20° 1.4762, saponification value 169.3, iodine number 145.8, and free fatty acid (per cent) 0.2641. One mg. daily of the oil furnished sufficient vitamin A for the growth of rats.

The association of copper with substances containing the fat-soluble A vitamin, J. S. McHargue (*Amer. Jour. Physiol., 72 (1925), No. 3, pp. 583–594*).—Data are reported on the content of copper in milk and milk products, differ-

ent parts of fowls, rats, and guinea pigs, and the livers and oil of codfish. These and other data reported in the literature are thought to indicate a relationship between the occurrence of copper and vitamin A. It is even suggested that "an organic colloidal compound of copper, such as probably exists in green leaves, germs of seeds, whole milk, blood, livers, and the yolk of eggs may be the fat-soluble A factor, and that a similar compound of manganese in some of these materials may function as the water-soluble B factor."

Production and nutritional value of commercial wheat germ extract, C. HOFFMAN (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 498–503, figs. 16*).—This is chiefly a report of the various studies made in connection with the development of the process of preparing the wheat germ extract which has been used as the source of supplementary proteins and vitamin B in the special bread described in a paper by Hale (E. S. R., 51, p. 458).

The product is described as a fine sugary powder, golden yellow in color, and of an agreeable malty taste. It is hygroscopic and readily soluble in water. Its composition in terms of dry extract is as follows: Maltose 47.7, dextrin 21.1, other carbohydrates by difference 7.29, protein (N×6.25) 15.36, ash 5.05, and moisture 3.5 per cent. The ash consists of potassium oxide 39.36, phosphorous pentoxide 37.40, sulfuric anhydride 7.34, magnesium oxide 4.80, chlorine 3.80, silica 2.74, sodium 2.50, calcium oxide 1.28, iron 0.294 per cent, and manganese a trace. On account of the relatively small amount of calcium 1 per cent of calcium carbonate is added to the dry extract when it is to be used as an infant food and food tonic.

Growth curves of rats are given showing that the extract as a source of vitamin B compares favorably with dry brewery yeast, and is about 10 times as effective as other malted products.

"It is apparent that wheat germ extract so prepared possesses valuable nutritive properties and should find a considerable use in human nutrition. A waste product of the flour mills, which has previously been used only as a cattle feed within a rather narrow area near the flour mills, may by this method be converted into a valuable, concentrated food for human beings and particularly for infants and invalids. It may be used in many ways as a supplement to the ordinary diet incorporated in food products of various kinds or it may even be used as a partial substitute for table sugar. In limited numbers of experiments made with human subjects, the results so far obtained lead to the conclusion that this extract may be extremely valuable as a modifier of milk for infants. The readiness with which it is assimilated and its ease of toleration add further to its possible usefulness in any disease caused by deficiencies which it may make up."

Fat-soluble vitamins.—XIX, The induction of calcifying properties in a rickets-producing ration by radiant energy, H. STEENBOCK and M. T. NELSON (*Jour. Biol. Chem., 62 (1924), No. 1, pp. 209–216, pl. 1*).—This paper, in continuation of the investigation noted on page 870, supplements the seventeenth paper of the series (E. S. R., 52, p. 862) by presenting histological evidence that a rickets-producing ration can be made antirachitic by exposure to ultraviolet light.

The ration selected as most suitable for the purpose was one described by McCollum et al. (E. S. R., 46, p. 473), consisting of wheat 33, corn 33, gelatin 15, wheat glutem 15, sodium chloride 1, and calcium carbonate 3 parts. If the corn used is yellow, this ration furnishes a sufficiency of vitamin A without much of the antirachitic vitamin. Some of the rats were kept upon this ration throughout the experiment. Others received it until definite signs of rickets appeared, when the same ration irradiated was substituted. Still others re-

ceived the irradiated ration from the start. As further controls, the basal ration plus cod-liver oil and the stock ration were used.

Histological examination of the radii and ulnae of the rats which were changed to the irradiated ration and kept on this for from 3 to 19 days showed in all cases but one a satisfactory deposition of calcium. In the one failure the irradiated ration had been fed only 3 days before the animal was killed.

Observations on the persistence of vitamin C in the livers of rats on a scorbutic ration, S. LEPKOVSKY and M. T. NELSON (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 91–96, figs. 2*).—The experiments reported by Parsons (E. S. R., 44, p. 862), in which the livers of rats were shown to have an abundance of vitamin C even after long subsistence on a diet deficient in this vitamin, have been repeated and extended.

As tested in the use of liver as a source of vitamin C in guinea-pig feeding experiments, young rats still contained an abundance of vitamin C in their livers after 114 days on a heated grain ration supplemented with salts and fat-soluble vitamin. The livers of the second generation of rats on this ration were equally rich in vitamin C.

Whole and skimmed milk powders as food—Observations on a new vitamin for reproduction, L. T. ANDEREGG and V. E. NELSON (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 451–455*).—The data reported supplement an earlier study by Anderegg (E. S. R., 51, p. 860) on the nutritive value of whole and skim milk powder, particularly with reference to the question of a specific vitamin for reproduction. In the present study 18 different diets were used, 13 of which had varying amounts of whole-milk powder as the chief source of protein, supplemented in some cases by casein. The remaining 5 had skim-milk powder as the sole source of protein. The other constituents of the diet included salt mixture, iron citrate, agar, and dextrin with or without starch, lard, butter, cod-liver oil, wheat embryo, and yeast.

Tabulated data on growth, reproduction, and rearing of the young on the various diets are thought to indicate that whole-milk powder supplemented with iron salts alone or with carbohydrate is adequate for growth, reproduction, and rearing of the young. The nutritive value of the ration is influenced by the relative amounts of protein, fat, and salts, and iron salts are thought to have a pronounced effect upon reproduction. The substitution of skim-milk powder for whole-milk powder resulted in failure of reproduction which was corrected in the first generation by either yeast or wheat embryo. Although the second generation on the supplemented ration grew normally, no reproduction took place. The possibility is suggested that yeast and wheat embryo furnish a vitamin for reproduction.

Experimental tuberculosis in rats on varied diets—Fat and vitamine factors, L. B. LANGE (*Amer. Rev. Tuberc., 11 (1925), No. 3, pp. 241–246*).—Using methods similar to those of a previous study of the effect of protein and salt factors in experimental tuberculosis in rats (E. S. R., 49, p. 859), the author has studied the effect of variation of fats and vitamins in the diet.

Four experimental diets were use, one of which was deficient in fat-soluble vitamin, another in vitamin B, and a third in fat-soluble vitamin with a high fat and low protein content. A fourth had a high fat-low protein content with no vitamin deficiency. The course of experimental tuberculosis in the groups on all of these diets was essentially the same as in the control diet, with the exception of the group on the diet high in fat but deficient in vitamins. The animals in this group showed an earlier complete elimination of tubercle bacilli.

Blood regeneration in severe anemia, I–IV (*Amer. Jour. Physiol., 72 (1925), No. 3, pp. 395–435, figs. 2*).—The investigation reported in the four

papers noted below was conducted along lines similar to those of an earlier investigation (E. S. R., 44, p. 564), except that in the present case a constantly maintained severe secondary anemia was produced in dogs by reducing the hemoglobin level to about 40 or 50 per cent and following this with frequent bleedings of amounts calculated to maintain this level.

I. *Standard basal ration bread and experimental methods*, G. H. Whipple and F. S. Robscheit-Robbins.—In this paper the details are given of the two standard basal rations used throughout the investigation and of the various methods, laboratory procedure, care of the animals, etc.

II. *Favorable influence of liver, heart, and skeletal muscle in diet*, F. S. Robscheit-Robbins and G. H. Whipple.— Of the three types of food used in this part of the investigation, beef liver proved most effective in the regeneration of hemoglobin and red cells. Abundant liver feeding for 2 weeks caused the production of from 90 to 100 gm. of hemoglobin more than the maintenance factor. Beef heart was less favorable, and beef muscle still less favorable. As compared with the earlier experiment, beef muscle proved less effective in the treatment of severe prolonged anemia than of the short anemia periods. The favorable effect of liver is thought to indicate that the liver is in some way concerned with pigment construction.

III. *Iron reaction favorable—arsenic and germanium dioxide almost inert*, G. H. Whipple and F. S. Robscheit-Robbins.—In contrast with the unfavorable effect of inorganic iron in the short anemia periods, iron treatment (Blaud's pills) was effective in the long-continued severe anemia. It is pointed out, however, that from these two simple types of experimental anemia it is impossible to predict the reaction to drug treatment to be expected in the complex human anemias often associated with chronic infection.

Arsenic preparations and germanium dioxide were practically inert.

IV. *Green vegetable feeding*, F. S. Robscheit-Robbins and G. H. Whipple.—In general green vegetables had only a slight effect in the regeneration of hemoglobin and red cells. "Chlorophyll may be very like hemoglobin in its chemical structure, but the normal dog can not utilize much if any of the chlorophyll nucleus for hemoglobin construction even under maximal stress."

ANIMAL PRODUCTION

Sunlight as an aid to animal growth, L. A. Maynard (*Cornell Countryman, 22 (1925), No. 9, pp. 267, 268, fig. 1*).—A popular review of the effects of sunlight on animal nutrition, with special reference to mineral metabolism.

Nutritive value of phosphorus in cattle feeds, J. Marcq (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 3 (1925), No. 1, pp. 58–64*).—A discussion of the results of phosphorus deficiencies in animals, with special reference to lamziekte.

The fundamentals of live stock judging and selection, R. S. Curtis (*Philadelphia: Lea & Febiger, 1925, 3. ed., rev., pp. XII+17–472, figs. 199*).—This is a revised and enlarged edition of the book previously noted (E. S. R., 43, p. 494).

[Beef cattle experiments at the Indian Head Experimental Farm], N. D. MacKenzie (*Canada Expt. Farms, Indian Head (Sask.) Farm Rpt. Supt. 1923, pp. 5–8*).—The results of the following experiments are briefly reported:

Corn v. sunflower silage for pregnant cows.—Four types of rations were compared for pregnant cows from about the fifth month of gestation until after calving. All groups received a basal ration of oat straw, and sufficient grain, consisting of equal parts of bran and ground oats, to maintain the

cows in good condition. In addition to the basal ration, one group received corn and sunflower silage mixed and alfalfa hay, the second group received sunflower silage and potassium iodide, the third group received corn silage, and the fourth group sunflower silage. The results, based on the numbers of calves showing goiters and the mortality, indicated that the addition of alfalfa hay was very desirable, since the calves born in this group were all normal and none were dead at birth. The addition of potassium iodide in the ration did not correct the deficiency. Corn silage, though apparently preventing goiter in this experiment, had not done so in a preceding experiment.

Sunflower v. corn silage for growing heifers.—In this experiment, lasting 106 days, corn and sunflower silage were compared when fed in addition to a basal ration of 5 lbs. of straw, 6 lbs. of alfalfa hay, and 4 lbs. of grain per head daily. The gains of the two heifers in each lot were very similar for the two types of silage, the one being 255 and the other 250 lbs. Both silages were equally palatable and readily eaten.

Steer feeding experiment.—Lots of 15 steers each were used for comparing the profits to be expected from feeding steers of different ages. The average daily gains made by the different lots during the 138-day test were 2.16 lbs. by the 2-year-olds, 1.76 lbs. by the yearlings, and 1.54 lbs. by the calves. The costs of the grain, silage, and straw fed, calculated at $20, $5, and $2 per ton, respectively, were $7.84, $8.45, and $6.35. Although the calves made the cheapest gains, these gains were largely in growth rather than in finish, and it is stated that 2-year-old steers are probably the most profitable class for feeding in outside corrals.

Dehorning.—The gains made by 15 hornless steers during the first month following purchase were compared with the gains of similar horned steers purchased at the same time but dehorned immediately. The former group made average gains per head during this period of 380 lbs., as compared with 265 lbs. for the dehorned animals.

Sheep husbandry in Canada, J. B. SPENCER (*Canada Dept. Agr. Bul. 41, n. ser. (1924), pp. 122, figs. 59*).—This is a popular survey of the sheep industry in Canada, dealing with early importations, the description and origin of breeds, feeding and management, and the Canadian wool industry, with a chapter on sheep diseases and their treatment by J. G. Rutherford. A previous edition has been noted (E. S. R., 20, p. 1066).

[Experiments with sheep at the Agassiz Experimental Farm], W. H. HICKS (*Canada Expt. Farms, Agassiz (B. C.) Farm Rpt. Supt. 1923, pp. 12–15*).—The results of the following experiments are briefly noted:

Breeding ewe lambs v. breeding as shearlings.—In this comparison 5 ewe lambs bred in the late fall produced an average of 1 lamb the first year and 1.4 lambs the second year, while a similar lot unbred the first year produced an average of 0.75 lamb the second year. The average weights of the two groups at the second year were 176 lbs. for the ewes bred at an early age as compared with 201 lbs. for the ewes bred later. The ewes bred as lambs also averaged 0.48 lb. less wool in the second year. It is concluded that the ewes bred as lambs have produced, on the whole, better gains than the nonbred ewe lambs.

Wool yields from different groups of sheep.—The effects of mating rams of various breeds with different ewes has shown the following average fleece weights: Purebred Dorset shearlings, 9.6 lbs.; Dorset third cross shearlings, 12.1 lbs.; and Oxford second cross shearlings, 12.8 lbs. The wool production of mature ewes was as follows: Purebred Dorsets, 7.7 lbs.; Dorset second

cross, 8.5; Dorset third cross, 7.9; Oxford first cross, 10; and Oxford second cross, 11.6 lbs.

Value of silage for pregnant ewes.—Poor lambing results accompanied the feeding of ewes during the winter on a ration of 1.25 lbs. of corn silage, 0.75 lb. of sunflower silage, 0.75 lb. of cut hay mixed with the silage, and 0.25 lb. of grain, but a short time following the change in the ration to choice clover hay without silage the percentages of the lambs raised materially improved. Up to January 10, 6 days after making this change in the feed, only 43.2 per cent of the lambs born were raised while 82.5 per cent were raised following this period.

Late lambing group.—Due to the above results, the late lambing ewes were divided into 2 lots on January 31, the one lot receiving mangels, while the other received silage. Of the ewes receiving silage, 55 per cent gave birth to premature lambs and 83.3 per cent of the lambs born were raised. Of the ewes fed mangels, 50 per cent lambed prematurely and 80 per cent of the lambs were raised.

[Experimental work with sheep at the La Ferme Experimental Station], P. Fortier (*Canada Expt. Farms, La Ferme (Que.) Sta. Rpt. Supt. 1922–1923, pp. 11–16*).—The results of the following experiments are briefly reported:

Improvement of the flock through the use of a purebred ram.—The results of breeding a purebred Cheviot ram to grade ewes during three successive generations showed that the wool production was apparently reduced in the second generation, as were also the weights of the individuals, but to a less extent.

Breeding of ewe lambs.—Fourteen ewe lambs were bred at the ages of from 8 to 8.5 months and compared with 12 ewe lambs mated at the ages of from 19 to 20 months as to weights at breeding time during the successive seasons and the number and vigor of the lambs born. The data recorded showed that the early bred ewes produced 83.3 per cent living lambs the first year and 100 per cent the second year, as compared with 125 per cent for the single crop of the late bred lambs. It is pointed out that the lambs bred at the early age were better developed than the late bred lambs at the time of breeding the younger ewes. The early breeding apparently had little effect on the development of the ewes except that those lambing late in the season were usually thinner at the following breeding season.

Best time for selling lambs.—The comparative results obtained in selling one lot of 11 lambs for the Christmas market and a similar lot for the Easter market are reported. The former lot were fattened immediately after selecting them in the fall, whereas the second lot received only a maintenance ration until early March, followed by a fattening ration until slaughtered. The lambs fattened for the Christmas trade made average gains of 39 lbs., while those fattened for the Easter trade gained an average of 170 lbs. It was calculated that a greater profit resulted from the lambs for the Christmas market, due to the better price and the smaller feed consumption.

Cross-bred vs. pure-bred lambs, J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que.) Sta. Rpt. Supt. 1923, p. 13*).—Crossbred and purebred Leicester lambs were compared as to their rate of growth to 6 months of age, 15 ewes of the breed being mated with a purebred Leicester ram, while a like number were mated with a purebred Shropshire ram. Fourteen purebred and 13 crossbred lambs were produced, each averaging 8.1 lbs. per head at birth. The purebred lambs gained 65 lbs. to 6 months of age as compared with 74 lbs. by the crossbred lambs.

Early versus late weaning experiment, C. F. Bailey (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1923, pp. 15, 16, fig. 1*).—Eight lambs were

weighed and weaned on July 12 and given a daily ration of 0.5 lb. of a grain mixture consisting of crushed oats and cracked corn (equal parts) with pasture. An equal number were allowed to run with their dams on pasture until August 14, after which both lots were put on rape pasture to September 14. The results showed that the early weaned lambs put on fresh pasture and fed grain made slightly larger gains than the late weaned lambs, and that they continued to make larger gains after both lots were weaned.

Fat-soluble vitamins.—XVIII, Sunlight in its relation to pork production on certain restricted rations, H. Steenbock, E. B. Hart, and J. H. Jones (*Jour. Biol. Chem., 61 (1924), No. 3, pp. 775–794, figs. 2*).—This is a more complete account of experiments previously noted (E. S. R., 53, p. 463). Detailed results are given showing the individual growth curves of the pigs, ash content of the bones, phosphorus content of the blood, and histological observations of the bones, as well as discussions of certain unexpected irregularities which occurred in the experiments.

"Hogging" soy beans and corn, W. L. Robison (*Breeder's Gaz., 87 (1925), No. 21, p. 579*).—A brief review of the results of experiments in hogging down corn and soy beans conducted at the State agricultural experiment stations.

Experiments with livestock, F. B. Headley, E. W. Knight, and L. E. Cline (*U. S. Dept. Agr., Dept. Circ. 352 (1925), pp. 15–18, fig. 1*).—The results of two pig-feeding experiments on the Newlands (Nev.) Experiment Farm are briefly reported.

Hog-feeding experiments.—In the first experiment four lots of 5 pigs each averaging approximately 40 lbs. in live weight at the beginning were selected for comparing a 2 per cent ration of barley with a 1 per cent ration of barley plus a 5 per cent ration of buttermilk when fed with alfalfa pasture or when alfalfa hay was supplied in racks. Of the two lots on alfalfa pasture, the one receiving the barley ration made an average daily gain per head of 0.64 lb. as compared with 0.60 lb. for the lot receiving barley and buttermilk. Of the two lots fed hay, the one receiving barley only made an average daily gain of 0.47 lb. as compared with 0.50 lb. for the lot receiving barley and buttermilk. The calculated costs of the feeds indicated that the pigs fattened on pasture made gains at a much lower feed cost than those fed hay. The feeding of the buttermilk also reduced the cost of gains in both groups as compared with those receiving barley alone.

Experiments with pigs on self-feeders.—At the conclusion of the above experiment, when the pigs weighed approximately 100 lbs., they were self-fed barley and no buttermilk was given to any of the lots. Very little pasture and practically no alfalfa hay were consumed. During the 42 days of this finishing period the average daily gains made by the different lots were 1.89, 2.24, 1.9, and 2.24 lbs. The barley consumed per 100 lbs. of gain was 408, 344, 409, and 383 lbs. in the respective lots.

[Experiments with swine at the Agassiz Experimental Farm], W. H. Hicks (*Canada Expt. Farms, Agassiz (B. C.) Farm Rpt. Supt. 1923, pp. 15–17*).—The results of the following feeding experiments are briefly noted:

Mineral mixtures, potatoes, and self-feeders.—Seven lots of 6 pigs each averaging about 90 lbs. in weight were selected for comparing various rations, including minerals and potatoes, and for studying the advisability of using a self-feeder in a 50-day experiment. Lot 1, receiving a grain mixture of shorts, corn meal, chopped oats, and chopped barley, 4:1:1:1, with minerals in a self-feeder, made average daily gains per head of 0.92 lb. The corresponding gains for lot 2, receiving the same grain mixture without minerals, were 0.98 lb., for lot 3 receiving similar grain hand-fed wet, with minerals, 1.28 lbs., for

lot 4 receiving the grain hand-fed wet without minerals 0.81 lb., for lot 5 receiving no grain but potatoes with minerals 1.09 lbs., and for lot 6 receiving potatoes fed without minerals 0.95 lb. Lot 7, receiving a hand-fed ration of half grain and half potatoes, with minerals, made average daily gains of 1.54 lbs.

The author concludes that the feeding of minerals in every case produced greater and cheaper gains than where no minerals were included. He also points out that no stiffness developed in any of the pens receiving potatoes, while the 2 self-fed lots suffered especially from rheumatism, it being worse in the group receiving no minerals.

Pasture and paddock feeding v. paddock feeding.—Two lots of 18 Yorkshire pigs each averaging 65 lbs. per head were selected for comparing the gains made by pigs fattened on clover and grass pasture and in dry lot. The grain ration fed in each case consisted of shorts and barley, 3:1. The pigs receiving the pasture made slower gains, but produced greater returns than the pigs fed in dry lot. The average gains of the latter lot were 1.15 lbs. per day during the 62 days to the time of slaughter. The lot receiving pasture made average daily gains of 0.65 lb. during the first 54 days, but with more intensive feeding during the following 31 days they made average daily gains of 2.37 lbs.

[Feeding experiments with swine at the Fredericton Experimental Station], C. F. Bailey (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1923, pp. 19–22*).—The results of the following experiments are briefly reported:

Corn v. barley.—Two lots of four 70-day old pigs each were selected for comparing corn and barley when fed with a ration of oats, shorts, skim milk, and mangels, with tankage in a self-feeder. The average gains per animal during the 151-day experiment were 177 lbs. for those receiving corn and 158 lbs. for those receiving barley. The pigs receiving corn were also graded somewhat higher at slaughtering time. The author concludes that barley can be used to replace corn in the fattening ration, but that the feed value is not so great and the hogs finish more slowly, though hogs receiving barley have a decidedly better finish than corn-fed hogs.

A comparison of corn, barley, and buckwheat.—In comparing corn, barley, and buckwheat for the production of bacon hogs, 9 lots of pigs were selected for a 123-day test. Three lots each received corn, barley, and buckwheat, with and without tankage, and with minerals in different lots. Oats, shorts, buttermilk and green feed were fed to each lot in addition to the grains compared. The average daily gains made per head were on the corn rations with tankage 1.39 lbs., without tankage 1.22 lbs., and with minerals 1.28 lbs., on the barley rations with tankage 1.25 lbs., without tankage 1.11 lbs., and with minerals 1.22 lbs., and on the buckwheat rations with tankage 1.42 lbs., without tankage 1.23 lbs. and with minerals 1.31 lbs.

The conclusions from the experiment are that the largest gains were made when tankage was included in the rations, but these were also the most expensive gains. Hogs finished on barley and buckwheat made the cheapest gains when 1.5 per cent minerals were included in the ration, while corn-fed hogs made the cheapest gains when neither minerals nor tankage were included. Hogs were finished somewhat more rapidly on corn or buckwheat than on barley. Buckwheat finished hogs, however, had a slight tendency to become overfat.

[Swine feeding experiments at the Nappan Experimental Farm], W. W. Baird (*Canada Expt. Farms, Nappan (N. S.) Farm Rpt. Supt. 1923, pp.*

12–14).—The results of the following swine feeding experiments are briefly noted:

Barley v. corn and green feed v. no green feed in the finishing ration.—In comparing corn and barley for finishing pigs in an 86-day test, two lots averaging 77 and 81 lbs., respectively, were selected. The former lot, receiving 2 parts of corn in a ration with 1 part each of oats and shorts and 8 per cent of fish meal during the latter part of the test, made an average daily gain per head of 1.22 lbs., while the other lot, receiving a similar ration with barley substituted for the corn, made an average daily gain of 1 lb. The dressing percentages of the two lots were 66.9 and 65.8, respectively. Two other lots of 5 pigs each, averaging 22 and 23 lbs., respectively, were selected for comparing green feed v. no green feed and during a 156-day test made average daily gains of 1 and 0.99 lb., respectively.

Cost of feeding crossbreds and summer v. winter feeding.—In comparing the gains and feed consumption during summer and winter, it was found that a lot of 18 pigs, averaging 47.3 lbs. at the beginning of the experiment, made an average gain of 1.04 lbs. per day during 125 days in summer. The winter-fed group of 28 pigs averaged 34.5 lbs at the beginning of the feeding period and made a gain of 0.92 lb. during 186 days. The calculated cost of feed per pound of gain was 6.39 cts. for the summer-fed pigs and 6.45 cts. for the winter-fed lot. In another comparison, 4 80-lb. pigs sired by a Berkshire boar from a Yorkshire sow made an average daily gain on 1.11 lbs. during 86 days as compared with 1.13 lbs. during a like period by 4 77-lb. pigs sired by a Yorkshire boar from a Berkshire dam.

Yorkshires v. Berkshires—summer v. winter feeding.—Five Yorkshires fed during the summer made an average gain per head of 1.15 lbs. per day during a 156-day test. A like number of Berkshires made an average daily gain of 0.85 lb. during a like period, and the calculated cost of feed per pound of gain was 7.92 cts. as compared with 5.8 cts. for the Yorkshires. In the winter-feeding experiment 14 Yorkshires, averaging 35 lbs. in weight, made an average daily gain of 1.03 lbs. during 178 days, while 14 Berkshires made a gain of 0.82 lb. during 194 days. The cost of feed was again greater for the Berkshires, being 6.95 cts. per pound as compared with 6.02 cts. for the Yorkshires.

[Feeding experiments with swine at the Ste. Anne de la Pocatière Experimental Station], J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que.) Sta. Rpt. Supt. 1923, pp. 9–11*).—The results of the following feeding experiments with swine are briefly noted:

Hand-feeding v. self-feeding.—Two lots of 4 pigs each were selected for comparing hand-feeding with self-feeding a ration of corn meal and middlings mixed in equal parts. The test lasted 75 days, during which the hand-fed animals gained an average of 48 lbs. as compared with 29.5 lbs. by the self-fed animals. It required 4.8 lbs. of grain to produce 1 lb. of gain by the former lot as compared with 7.5 lbs. by the hand-fed animals.

Milk powder v. skim milk.—Two lots of 5 pigs each were fed during a 114-day test conducted in winter. The basal ration consisted of corn meal, middlings, shorts, and oatmeal in equal parts, with roots. The average gains per animal were 116.2 lbs. for the lot receiving milk powder and 129 lbs. for the lot receiving skim milk. The estimated feed cost, however, was 9 cts. per pound of gain on milk powder as compared with 5 cts. per pound of gain on skim milk.

Milk powder v. skim milk.—This experiment was similarly conducted to the one noted above during the summer months. Two lots of 6 pigs each were used, and the test period lasted 134 days. The average gains per animal were

158.7 lbs. on the milk powder and 152.3 lbs. on skim milk. The feed cost per pound of gain was 6.6 cts. in the former and 4.9 cts. in the latter group. It is indicated that unless milk powder can be obtained for less than 15 cts. per pound it could hardly be economically used in place of skim milk.

Pasture and dry lot feeding [of swine], N. D. MacKenzie (*Canada Expt. Farms, Indian Head (Sask.) Farm Rpt. Supt. 1923, pp. 10, 11*).—Six lots of 10 pigs each were selected for comparing various methods of fattening during a 56-day experiment. The following average gains per head were made under the different methods of feeding: Sweet clover and tankage 59 lbs., rape and tankage 60 lbs., Hubam sweet clover and tankage 53 lbs., pigs self-fed in dry lot with tankage 78 lbs., hand-fed in dry lot with tankage 63 lbs., and hand-fed in dry lot with buttermilk 47 lbs. Estimates of the cash value of the different pastures were in favor of rape and sweet clover as compared with Hubam clover. The rate of gain, though most rapid in the self-fed lot, was also the most expensive. The carcasses of the pigs on rape and sweet clover were the best.

Fitting, showing, and judging hogs, E. Z. Russell (*U. S. Dept. Agr., Farmers' Bul. 1455 (1925), pp. II+22, figs. 13*).—Directions for the management, feeding, and selection of swine for showing, including related information on fitting and showing.

Feed consumed by draft horses and cost of horse labour, J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que.) Sta. Rpt. Supt. 1923, p. 6*).—The food consumption and number of hours worked by 8 mature draft horses have been carefully recorded, the average cost of the feed being 5.5 cts. per hour when these animals worked 80 per cent of the total workable hours. The amount of feed required to grow 4 Percheron colts from birth to 2.5 years of age is estimated as varying from $107 to $134.

A shortage of work horses seems probable, J. I. Falconer (*Ohio Sta. Bimo. Bul., 10 (1925), No. 7, pp. 101, 102*).—The average age of farm horses in Greene and Medina Counties, Ohio, was found to have increased from 8.5 to 11.2 years from January 1, 1920, to January 1, 1925. At the former date 57 per cent of the horses were under 7 years of age, while only 25 per cent were under 7 years of age in 1925. Other data also predict a future shortage of good work horses.

Poultry investigations, D. C. Kennard (*Ohio Sta. Bimo. Bul., 10 (1925), No. 7, pp. 117–128, figs. 2*).—Progress reports are given on the more recent poultry investigations being conducted at Wooster, at the Northeastern and Southeastern Test Farms, and at the Clermont County Experiment Farm.

Hatchability and egg production as affected by the ration.—In studying the effect of different rations on egg production and the hatchability of the eggs, 8 lots of 50 White Leghorns each were selected. Six lots were confined indoors where direct sunlight was excluded, while 2 lots were allowed blue-grass range. All lots received a basal ration of ground corn, ground wheat, ground oats, standard wheat middlings, bran, and meat scrap. The confined birds received supplements of skim milk with no drinking water, chopped alfalfa hay, and 2 per cent of cod-liver oil in the different lots. The 2 pens receiving the basal ration only without sunlight laid 67 and 69 eggs per bird from October 30, 1924, to June 15, 1925. In these lots 22 and 14 per cent of the birds died. Of the eggs incubated from these 2 lots, 29 and 43 per cent hatched. Pens receiving supplements of skim milk and chopped alfalfa hay laid 88 eggs each, but the mortality was 26 per cent in the former and 4 per cent in the latter pen. The hatching percentages were 45 and 39 per cent, respectively. The 2 pens receiving cod-liver oil laid an average of 94 and 88 eggs and the mortality was

6 and 2 per cent. The hatching percentages were 29 and 34 per cent. The best results were obtained with the 2 lots of birds receiving blue-grass range in addition to the basal ration. The average egg production was 110 and 104, the mortality 2 and 6 per cent, and the hatching percentages of the eggs 61 and 51 per cent, respectively.

Ground grain v. whole grain for chickens.—This is mainly a discussion of the comparative merits of feeding mash and scratch-feed rations and of mash rations to young chickens, laying pullets, and laying hens. The all-mash ration appears to be increasing in favor. In tests with lots of laying hens and pullets the all mash ration gave practically the same results in egg production and mortality as a ration containing both mash and scratch feed.

Keeping the layers indoors.—In two tests it has been found possible to successfully keep White Leghorn pullets confined indoors for the entire year. The birds received a mash consisting of ground corn, ground oats, standard wheat middlings, bran, meat scrap, dried buttermilk, alfalfa meal, and salt and a scratch feed of corn, wheat, and oats. Warm skim milk and warm water were provided in the winter. The ration was also supplemented with cabbage or fresh red clover and alfalfa hay. The birds produced an average of 161 eggs per year in the first test and 113 eggs from November 13, 1924, to June 15, 1925, in the second test.

Sources of lime for eggshells.—Three tests of the comparative value of different sources of lime for poultry have been conducted, preliminary results of which were noted (E. S. R., 51, p. 471). As the results are somewhat inconclusive, it is recommended that both oyster shells and limestone grit be supplied to laying hens, but there appears to be no need for mica grit or quartz grit.

[Experiments with poultry at the Agassiz Experimental Farm], W. H. Hicks (*Canada Expt. Farms, Agassiz (B. C.) Farm Rpt. Supt. 1923, pp. 33–36*).—The results of the following feeding experiments are briefly noted:

Commercial feeds v. home mixture.—From the first 6 months' results of an experiment involving 10 pens of 10 birds each, the author concludes that the home-mixed feeds produced better showings, but states that, due to the difficulty of mixing, the commercial feeds may frequently be desirable in individual cases.

Confinement v. range.—In a comparison with 2 pens of Barred Rock and 2 pens of White Leghorn hens the egg production of the confined birds was decidedly the better.

[Experiments with poultry at the La Ferme Experimental Station], P. Fortier (*Canada Expt. Farms, La Ferme (Que.) Sta. Rpt. Supt. 1922–1923, pp. 62, 63*).—The results of the following experiments are briefly noted:

Comparison of roots and clover for winter egg production.—Of 2 lots of 25 pullets each, lot 1 received cut clover soaked 24 hours in the mash and with dry clover available at all times. Lot 2 received cut mangels in the mash and with whole mangels constantly available. The results during the period November 20 to April 30 showed that the lot receiving clover laid 579 eggs as compared with 460 eggs by the lot receiving mangels. The calculated cost of 1 doz. eggs was 4.06 cts. on the clover and 5.06 cts. on the roots.

Pullets v. hens for fertility, hatchability, and viability of chicks.—In a comparison for hatching purposes, it was found that the hens' eggs were 88.5 per cent fertile as compared with 91.7 per cent for the pullets' eggs. Of the fertile hens' eggs, 43.2 per cent hatched as compared with 22.9 per cent of the fertile pullets' eggs.

[Experiments with poultry at the Ste. Anne de la Pocatière Experimental Station], J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière*

(*Que.*) *Sta. Rpt. Supt. 1923, pp. 22–26*).—Results of these experiments ar reported.

Feeding pullets and yearling hens.—The average egg production of pullet and yearling hens fed with only slight differences in the rations was compared and it was found that the pullets produced an average of 83.8 eggs per bir as compared with 93 by the yearling hens. It is pointed out that the hens ha been selected from pullets which did the best during the first year's produc tion.

Methods of storing eggs for winter use.—In a comparison of various method of storing eggs from July 15 to December 15, the results would indicate tha water glass or limewater was the most satisfactory. Salt gave poorer re sults, but may be advantageous for short periods of storage. Other method used included wrapping the eggs in tissue paper with and without firs dipping them in boiling water and storing in carton boxes and dipping i boiling water but not wrapping.

Cost of rearing pullets.—The feed costs of rearing pullets have been deter mined for the periods from hatching to 3 weeks of age, from 3 to 8 weeks c age, and from 8 weeks to 4 months of age, as 3.5, 12, and 39.33 cts. per bird, re spectively. The birds used consisted of 30 per cent of Barred Plymouth Rock and 70 per cent of Rhode Island Reds.

Beef scrap v. meat v. milk as animal feed for egg production.—Four pens c 10 birds each were selected for comparing various sources of protein for eg production. Lot 1 received 15 per cent of beef scrap in the dry mash, lot received horse flesh cooked and available at all times in addition to the mas and a grain mixture, lot 3 received skim milk as a drink, with dry mash an grain, while lot 4 received only dry mash and the standard grain ration. Th scratch grain was composed of cracked corn, wheat, and oats, while the dr mash contained corn meal, ground oats, and bran. The calculated profits whe the different proteins were included in the ration were as follows: Beef scra $2.83, milk $1.80, control 55 cts., and horseflesh 13 cts.

Home-mixed feed v. commercial feed for winter egg production.—Two per of 12 birds each were used for comparing commercial and home-mixed feed for egg production from December to March, inclusive. Little difference i the production of the two pens was evident, but the home-mixed ration co less per 100 lbs.

[**Experiments with poultry at the Indian Head Experimental Farm**, N. D. MACKENZIE (*Canada Expt. Farms, Indian Head* (*Sask.*) *Farm Rpt. Sup 1923, pp. 39–42*).—The results of the following experiments are briefly noted

Hatching results—hens v. pullets.—In a comparison of the hatching of th eggs of hens and pullets, the percentage fertile was 52 in each case, and the pe centage of the fertile eggs hatching 28.4 and 26.9 per cent, respectively. In comparison of the hatches of eggs laid in March, April, and May, the fertilit was found to be 41.5, 57.3, and 56.6 per cent, respectively, and the percentag of fertile eggs hatched 22, 20, and 34.6, respectively. The percentage c chicks raised was much greater in the March hatches than in the April ar May hatches.

Ordinary feed v. ordinary feed plus cod liver oil for chicks.—Of 2 lots c chicks selected and compared as to their rate of growth, the average gai per chick in the cod liver oil lot were 0.4 oz. as compared with 0.28 oz. in th lot receiving no cod liver oil. Of the chicks receiving no cod liver oil, per cent showed signs of weakness at the conclusion of the experiment. T amount of cod liver oil was 2 per cent of the mash.

Buttermilk v. water.—A group of 100 chicks was divided into two lots for a comparison of the rate of growth when one lot received buttermilk and the other water as a drink. The chicks receiving buttermilk, though showing a greater mortality (14 birds), made average gains of 3.1 oz. as compared with 2.7 oz. for the birds receiving water, though the mortality in this lot was only 6.

Snow v. water for winter.—Two lots of 10 pullets each were selected for carrying on this test during five months. The lot receiving water laid an average of 13.2 eggs as compared with 20 eggs by the lot receiving snow. The former lot, however, consumed considerably less feed.

Beef scrap v. tankage.—In a comparison of beef scrap and tankage as sources of protein for egg production, tankage gave somewhat the better results in contradiction to the results of the experiment conducted in the preceding year.

Commercial v. home-mixed rations.—Two lots of 10 pullets each were selected for comparing commercial feed with home-mixed feed for egg production. The lot receiving commercial feed laid an average of 88.4 as compared with 90.3 eggs by the lot receiving the home-mixed feeds. It was pointed out that the home-mixed ration was considerably cheaper.

Nutritional studies of the growing chick.—I, The relation of sunlight and green clover to leg weakness in chicks, R. M. Bethke, D. C. Kennard, and M. C. Kik (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 377–390, figs. 5*).—For quantitative tests of the amount of the antirachitic vitamin in fresh red clover, 14 lots of day-old chicks were selected at the Ohio Experiment Station. The basal ration fed to all lots consisted of 80 parts of a grain mixture made up of 2 parts of ground white corn and 1 part of standard wheat middlings, 16 parts of casein, and 4 parts of a mineral mixture.

Lots 1 to 10 were housed in a building where direct sunlight was inaccessible, while lots 11 to 14 were allowed all-day exposure to sunlight. The supplements to the basal ration and the treatment of the birds are as follows: Lots 1, 4, and 5 received a mixture of 3 parts by weight of the basal ration and 1 part of green fresh red clover, and the two latter lots received daily exposures of ½ and 1 hour of direct sunlight, respectively. Lots 2, 6, and 7 received 3 parts of the basal mash to 2 parts of green clover, and the rations of lots 6 and 7 were further supplemented by daily exposure to sunlight for ½ and 1 hour, respectively. For lots 3, 8, and 9 equal parts of the basal ration and green clover were mixed, and the two latter received ½ and 1 hour daily exposures to sunlight. Lot 10 received chopped green clover ad libitum in addition to the basal ration. This lot was later divided, one-half of the birds receiving a daily exposure to ½ hour of sunlight. Lots 11 and 14 received finely chopped green clover ad libitum in addition to the basal ration, and soil which was renewed twice weekly was supplied in a portion of the runways for lots 11 and 12. After 12 weeks on these rations a part of the surviving birds were sacrificed for analysis of the tibias.

The results showed that the green clover would not prevent leg weakness even when fed in equal amounts with the basal ration, as 100 per cent of the birds surviving at 10 weeks of age developed rickets when they had received no exposure to sunlight. The green clover, however, apparently delayed the onset of rickets, and the gains were continued longer than when no green feed was furnished. One-half hour exposure to sunlight daily prevented the appearance of leg weakness, and the rate of growth was stimulated. Soil seemed to lower the mortality but had no effect on growth. The outdoor birds receiving clover showed some advantage in the way of activity and bodily vigor as

compared with birds similarly treated but receiving no green feed. The ash analyses of the bones were in general agreement with the behavior and nutritional condition of the different lots, the content in birds exposed to direct sunlight being from 13 to 15 per cent higher than in unexposed birds. Though recognizing valuable properties in green feeds for raising young chicks, the authors do not believe that sufficient amounts can be consumed to prevent the onset of leg weakness.

The relative value of ultra-violet light and irradiated air in preventing rickets in chickens, J. S. HUGHES, C. NITCHER, and R. W. TITUS (*Jour. Biol. Chem., 63 (1925), No. 2, pp. 205–209, figs. 2*).—In three experiments at the Kansas Experiment Station, the use of irradiated air was compared with direct radiation of ultra-violet light for the prevention of rickets in 3-weeks-old chickens deficient in the antirachitic vitamin. At the end of 8 weeks the chicks on the check ration and those receiving the exposure to irradiated air for 10 minutes twice daily developed rickets, while none in the lot receiving the ultra-violet light treatments was rachitic. Analyses of the bones were approximately 1.1 per cent higher in calcium and from 0.4 to 0.5 per cent higher in phosphorus in the nonrachitic than in the rachitic birds. The authors conclude that ultra-violet light prevents rickets by its direct action on the chickens and not by any action on the air which the chickens breathe.

The problem of maintaining body weight, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 13 (1925), No. 10, pp. 4, fig. 1*).—The 435 Leghorns entered in the first Vineland egg-laying contest during their pullet and second laying years were classified according to live weight and egg production in the winter, spring, and summer-fall months. As pullets the heavier birds were the best winter layers, while in the second year the most favorable weight for winter production was 4.5 lbs. The highest spring production was manifested by birds weighing from 4 to 5 lbs. in both years. Summer-fall production was highest from birds weighing approximately 4 lbs. The birds averaging from 4 to 4.5 lbs. were the best producers as pullets, and when this weight was exceeded in the second year there was a marked falling off in yearly production.

Sex-linkage for egg production and table poultry, R. C. PUNNETT (*[London]: Daily Mail [1925], pp. 32*).—A popular account of the material given in the chapters on sex-linked inheritance in the book previously noted (E. S. R., 49, p. 674).

The Maryland State egg-laying competition and performance tests, R. H. WAITE and F. H. LEUSCHNER (*Maryland Sta. Bul. 273 (1925), pp. 171–185, figs. 5*).—Plans for conducting the State egg-laying contest, including the rules and regulations and other related information.

Rules and regulations for the second Utah intermountain egg-laying contest, B. ALDER (*Utah Sta. Circ. 55 (1925), pp. 4*).—General information and rules and regulations for conducting the second Utah intermountain egg-laying contest (E. S. R., 52, p. 174).

Producing market eggs of high quality, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 13 (1925), No. 11, pp. 4*).—Largely a discussion of the factors influencing quality in market eggs, with a classification of the New Jersey poultry farms producing poor quality and high quality eggs, including notations on differences in feeding and management.

Researches on the optimum conditions of artificial incubation of poultry eggs, L. C. BOUGES (*Recherches sur les Conditions Optima de l'Incubation Artificielle des Œufs de Poules. Thesis, Univ. Toulouse, 1923, pp. 83, figs. 9*).—This reports the results of a study of the optimum temperature, humidity, ventilation, and other requirements for natural and artificial incubation.

Concerning the mode of transference of calcium from the shell of the hen's egg to the embryo during incubation, G. D. Buckner, J. H. Martin, and A. M. Peter (*Amer. Jour. Physiol., 72 (1925), No. 2, pp. 253–255*).—In experiments at the Kentucky Experiment Station the contents of eggs were carefully removed and the shells filled with distilled water for a study of the transference of calcium from the shell of the hen's egg to the embryo. After carbon dioxide was bubbled through the distilled water in the shell for four hours the pH value of the water was found to decrease from 8.3 to 6.8, and chemical tests demonstrated the presence of calcium carbonate in amounts calculated at 0.0107 to 0.0118 gm. per egg. When the eggshell was refilled with egg albumin, the albumin of two eggs so prepared and allowed to remain in a carbon dioxide atmosphere contained the equivalent of 0.0102 and 0.0098 gm. of calcium carbonate, respectively, while controls in air contained 0.0034 and 0.0027 gm.

The authors believe that these results prove that water containing carbon dioxide passes through both shell membranes and dissolves calcium from the shell and then diffuses back into the egg as calcium bicarbonate. It is inferred that this is the process which goes on up to the ninth day of incubation, after which the allantois touches the shell membrane and the transfer of calcium and carbon dioxide is probably direct.

Artificial incubation of hen eggs in New Mexico, A. L. Walker and G. E. Voss (*New Mexico Sta. Bul. 147 (1925), pp. 21, figs. 5*).—This discusses the important points to be considered in the artificial incubation of hen eggs with reference to the results of experiments conducted at the New Mexico Station. Due to the dry climate, the prevention of evaporation is a very important factor. In a comparison of a hot air and a hot water incubator, the eggs in the hot-air incubator lost 11.89 per cent of their weight as compared with 8.96 per cent in the hot-water incubator. The hatching percentages were, however, in favor of the hot-air incubator, the hatching results being 66.42 and 58.78 per cent. Sand trays were used in both incubators to supply moisture, and the amount of ventilation was limited during the first week.

Favorable results from the use of appliances for keeping up the humidity were previously noted (E. S. R., 47, p. 475; 51, p. 471). In another experiment in which various temperatures in the incubator were compared, the best results occurred with a temperature of 101° F. during the first week, 102° during the second week, and 103° during the third week. The other combinations of temperatures used for comparison were 102–102–103°, 102–103–104°, and 103–103–103°.

A cooling experiment was also conducted in which one lot of eggs was cooled until the little end felt cold when touched to the eyelid. The cooled eggs lost 10.32 per cent of their weight and 56 per cent hatched. The eggs not cooled lost 11.54 per cent in weight and 48 per cent hatched.

How to pick chickens (*U. S. Dept. Agr., Misc. Circ. 42 (1925), pp. 14, figs. 12*).—Illustrated directions for dry picking chickens.

DAIRY FARMING—DAIRYING

[Feeding experiments with dairy cattle at Fredericton, N. B.], C. F. Bailey (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1923, pp. 10–13*).—The results of the following experiments are noted:

Test of turnips, corn, and sunflower silage as succulent feed for dairy cows.—Three groups of cows were selected, and each lot was fed during three periods so that all lots received the different succulent feeds at different times. The

grain mixture fed to all lots consisted of equal parts of bran, crushed oats, oil cake, and brewers' grains, and mixed clover and timothy of good quality was fed in addition.

The results indicated that mature corn silage has a greater value for milk production than sunflower silage, but that immature corn silage is not so valuable. Corn was invariably more palatable than sunflowers. Turnips were found satisfactory for keeping up the milk flow, but had less value per ton and were inferior to corn silage and sunflower silage for producing gains in live weight, provided the cows ate sunflower silage satisfactorily.

Straw v. hay for wintering growing heifers.—Two lots of 7 heifers each were selected, one lot receiving a ration of 5 lbs. of hay in the morning with oat straw at night and 35 lbs. of corn silage daily and the other lot receiving 10 lbs. of hay and 35 lbs. of corn silage. The results showed that heifers will make fair growth on corn silage, hay, and straw, but not so large gains as when receiving a full allowance of hay, the average daily gains during the 28-day feeding period being 1.65 and 2.34 lbs., respectively.

[Feeding experiments with dairy cattle at the Kapuskasing Experimental Station], S. BALLANTYNE (*Canada Expt. Farms, Kapuskasing (Ont.) Sta. Rpt. Supt. 1923, pp. 5–9*).—Results of two experiments in which sunflower silage was compared with oat, pea, and vetch silage are reported.

Sunflower v. oat, pea, and vetch silage for milk production.—In this test 10 cows were used, the comparison being conducted in alternate periods of 30 days' duration and each type being fed for two separate periods. The average milk production per cow daily during the second period when 40 lbs. of oat, pea, and vetch silage was fed was 25.98 lbs., as compared with 26.79 lbs. as the average for periods 1 and 3 when 45 lbs. of sunflower silage was fed. In the other comparison which it was possible to make by this method of feeding, the average production of period 3 when sunflower silage was fed was 23.64 lbs., as compared with 23.48 lbs. for the average of periods 2 and 4 when the cows received oat, pea, and vetch silage. The author concludes that there is little to choose between sunflower and oat, pea, and vetch silage for milk production and palatability.

Sunflower v. oat, pea, and vetch silage for growing calves.—Ten calves were selected for conducting this test in a manner similar to the preceding, four 30-day periods being used for the feeding. During the two periods 1 and 3 when sunflowers were fed the calves made an average daily gain of 1.03 lbs., as compared with 1.32 lbs. during periods 2 and 4 when oat, pea, and vetch silage was used in the ration.

Alfalfa and clover hays for growing dairy heifers, C. C. HAYDEN (*Ohio Sta. Bimo. Bul., 10 (1925), No. 7, pp. 105–110, figs. 2*).—A more complete account of investigations previously noted (E. S. R., 51, p. 475).

Effect of feeding green rye and green cowpeas on the flavor and odor of milk, C. J. BABCOCK (*U. S. Dept. Agr. Bul. 1342 (1925), pp. 8, figs. 2*).—Continuing the studies of the effect of green feeds on the flavor and odor of milk (E. S. R., 53, p. 75), a similar investigation of green rye and green cowpeas has been conducted. Ten Holstein and 10 Jersey cows were divided into four groups for the feeding tests with the green rye. One group was fed the basal ration of hay and grain, while the others received the following amounts of green rye fed as supplements to the basal ration: Fifteen lbs. 1 hour before milking, 30 lbs. 1 hour before milking, and 30 lbs. immediately after milking. The feeding of the groups was changed after a 4-day period, followed by 1 day in which no green feed was given.

Of the samples of milk obtained from the cows while on the control rations, 98 per cent were rated as normal in flavor and 97.6 per cent as normal in odor. The milk produced from cows consuming 15 lbs. of green rye 1 hour before milking was rated as normal in flavor in 86.9 per cent of the cases and normal in odor in 86.5 per cent of the samples, 10.6 and 11 per cent, respectively, were rated as very slightly off in flavor and odor, while 2.5 per cent were slightly off in each quality. The percentage of samples rated as very slightly off and slightly off were practically doubled with the feeding of 30 lbs. of the green rye 1 hour before milking. From such feeding, 75 per cent of the samples were normal in flavor and 73.3 per cent were normal in odor. Feeding 30 lbs. of the green rye immediately after milking had very little effect on the flavor and odor of the milk produced at the next milking, as 92.3 per cent of such samples were rated as normal in flavor and 91.6 per cent as normal in odor.

The experiments with green cowpeas were conducted similarly to those with green rye, using 7 Holstein and 13 Jersey cows. The samples of milk produced on the control ration were rated as 92.4 per cent normal in flavor and odor. When the cows received 15 lbs. of cowpeas 1 hour before milking, 75.5 per cent of the samples were normal in flavor and odor, while 20.3 per cent were very slightly off in flavor and 19.8 per cent in odor. When 30 lbs. of cowpeas were fed 1 hour before milking, only 69.2 per cent of the samples were normal in flavor and 68.7 per cent in odor, and 24.1 and 24.6 per cent were very slightly off in flavor and odor, respectively. Of the samples 5.1 per cent were slightly off in flavor and odor and 1.6 per cent were off in flavor and odor. When 30 lbs. of the green cowpeas were fed immediately after milking, 83.6 per cent of the samples were normal in flavor and 83.1 per cent normal in odor, 15.3 per cent were very slightly off in flavor, and 15.8 per cent in odor.

The author concludes that with the feeding of green rye and cowpeas after milking there was at most only a very little effect on the flavor or odor of the milk produced at the next milking. The flavors and odors produced by green cowpeas were, however, greater than those produced by green rye.

The taste of turnips in milk [trans. title], [S.] ORLA-JENSEN (*Lait, 5 (1925), No. 41, pp. 30–33*).—Investigations of the cause of a turnip flavor appearing in milk showed that a type of bacteria liquefying gelation was responsible. This flavor was found to be more pronounced in pasteurized samples. It is concluded that the organism was introduced through the water. The same organism was found to cause the production of rancid butter.

The effect of giving certain oils in the daily diet of cows on the composition of butter fat, H. J. CHANNON, J. C. DRUMMOND, and J. GOLDING (*Analyst, 49 (1924), No. 580, pp. 311–327, figs. 6*).—The authors report chemical determinations of the quality of the butterfat produced by cows fed different oils in the experiments previously noted by Drummond et al. (E. S. R., 53, p. 377).

The results showed a general fall in the Reichert-Wollny values of the fat throughout the 7 months of the experiment, with slight increases during the middle of the periods when coconut, peanut, and cod liver oils were being fed. There was a marked drop at the end of the cod liver oil period, which was continued through the pasture period. No perceptible drop accompanied the feeding of the other oils. The saponification value of the butterfat also fell markedly during cod liver oil feeding, while it fell with only one of the cows (peanut oil) receiving the other oils. The saponification value rose during the period when seeds hay was fed, but remained low when the cows were on pasture. The iodine numbers showed slight decreases on the basal

rations. The butterfat from the cow receiving peanut oil rose, while all showed a distinct rise when cod liver oil was given. The iodine numbers tended to remain high while the animals were on pasture, and the refractive indexes showed the same general trends as the iodine numbers. The melting points of the butterfat remained at approximately 30° C. except when the two cows received peanut oil, at which time they dropped to 21 and 14°, respectively, at the end of the period.

Studies of the quality of the butterfat by fractional distillation of the esters from the fatty acids did not yield results of practical importance.

The Wallachian sheep's milk productiveness [trans. title], V. O. Svidenko (*Izv. Opytn. Dona i Sev. Kavkaza (Jour. Agr. Research Don and North Caucasus), No. 2 (1923), pp. 69–82, 138*).—The milk production, fat content, and other qualities of the milk of 16 Wallachian ewes were recorded throughout the lactation period.

New and corrected names of certain milk bacteria, W. D. Frost and R. C. Noland (*Wis. Acad. Sci., Arts, and Letters, Trans., 21 (1924), pp. 219–222*).—The correct names, with their synonyms, of various bacteria occurring in dairy products are noted.

A simple method of determining the keeping quality of milk, J. M. Fuller, H. F. DePew, and B. E. Huggins (*Creamery and Milk Plant Mo., 13 (1924), No. 12, pp. 45–48*).—The keeping quality of 262 samples of milk, as measured by the time required to develop an acidity of 0.3 per cent, was determined at the New Hampshire Experiment Station. The initial acidity of the samples, as well as the time required for reduction to occur in the methylene blue reductase test, was likewise determined.

From the results, the authors conclude that initial acidity is not an accurate indicator of the keeping quality of the milk. The reductase test, however, was found to serve as a simple and inexpensive method of determining the keeping quality. Milk requiring more than 5.5 hours for reduction kept over 12 hours, and many samples had not soured in 14 hours. Milk requiring from 2 to 5.5 hours for reduction soured in 82 per cent of the cases in from 10 to 14 hours. The samples causing reduction in less than 2 hours all soured in less than 12 hours.

The influence of various methods of pasteurization on the digestibility of the protein and mineral compounds in milk [trans. title], E. F. Terroine and H. Spindler (*Lait, 5 (1925), No. 43, pp. 241–256*).—For this investigation raw milk and milk heated to 63° C. for 25 minutes, to 75° for from 4 to 5 seconds, and to 95° for from 1 to 2 minutes were fed to four different pigs at the rate of 150 calories per kilogram of live weight. In a second experiment four types of milk were each fed to three pigs in successive weekly periods. The digestibility of the protein and minerals was determined in each case.

The results are tabulated in detail, showing the nitrogen and minerals consumed and excreted. Much variability was observed in the way the animals digested the ash. The protein digestibility of the different milks was very uniform, averaging from 95 to 97 per cent, while the average ash digestibility varied from 59 to 88 per cent. The differences were not apparently influenced by the pasteurization.

The effect of heat on the solubility of the calcium and phosphorus compounds in milk, R. W. Bell (*Jour. Biol. Chem., 64 (1925), No. 2, pp. 391–400*).—The CaO and P_2O_5 contents of raw skim milk and similar samples heated to from 140 to 180° F. were determined prior to filtering and for the filtrate after running the samples through a Pasteur-Chamberland filter in studying the effect of heat on the solubility of calcium and phosphorus in the milk. The average loss of calcium in the filtrate, due to heating from 140 to

160°, was less than 0.0032 per cent, while the difference in the calcium content in the filtrate of the same sample, using different filters, was as great as 0.0041 per cent. The loss was 0.0053 and 0.0039 per cent for the calcium after heating to from 170 to 180°, respectively. The P_2O_5 loss in the filtrate was also highest after heating to 170°, it being 0.0059 per cent after this treatment.

In other tests, using a high-speed centrifuge, the CaO, P_2O_5, and ash contents of the deposit on the bowl and the filtrate were determined for raw skim milk and for samples heated to from 150 to 212°. These tests showed that the CaO and P_2O_5 contents in the filtrate decreased, while their contents in the precipitate on the bowl increased as the temperature of heating was raised. The ash of the filtrate decreased, while that of the precipitate increased with increased temperatures.

It is, therefore, concluded that heating milk tends to precipitate a portion of the calcium and phosphorus, and the amount precipitated is greater with the higher temperatures. These experiments were conducted at the department of dairy industry of the New York Cornell Experiment Station.

The effect of heat in destroying enzymes in cream, E. H. Parfitt (*Creamery and Milk Plant Mo., 13 (1924), No. 12, pp. 52, 53*).—Studies at the Indiana Experiment Station of the proteolytic enzyme activity of pure cultures of several bacteria in meat broth and of sweet and sour cream showed that flash and holding pasteurization inactivated 64 and 71 per cent of the enzyme, respectively. The studies were made by inoculating skim milk with a filtrate from pure cultures on meat broth or with the filtrate from cream run through diatomaceous earth filters. Sweet cream was found to possess very little proteolytic activity, while the development of peptones in skim milk was pronounced when inoculated with the filtered sour cream. Pasteurizing the sour cream for 30 minutes at 145° F. destroyed 82 per cent of its proteolytic activity.

The relation of the acidity of the cream to the fishy flavor in butter [trans. title], E. Haglund and E. Waller (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 261 (1924), pp. 16*).—The results of these investigations, conducted during 1922 and 1923, were mainly confirmatory of those previously noted (E. S. R., 49, p. 74). It is concluded that butter made from cream containing small amounts of acid or in which the acid has been partially neutralized is not so likely to develop a fishy flavor in storage as butter made from acid cream. Variations in the salt content of the butter tend to produce a coarse or bitter product.

Variation in the Reichert-Wollny indexes of Argentine butter [trans. title], P. Lavenir (*Lait, 5 (1925), No. 42, pp. 117–125*).—Determinations of the Reichert-Wollny index of 1,681 samples of Argentine butter collected during the different months from January, 1920, to December, 1921, and January, 1923, to February, 1924, are reported. The indexes varied from a minimum of approximately 22 to a maximum of 33 and averaged approximately 27.

A study of the monthly fluctuations showed that the butter produced in the winter months of May, June, July, and August tended to have a low index, while butter produced in October, November, December, and January had a high index. The possibility of the temperature, feeding, and other factors causing these variations is pointed out. The importance of the variation is discussed, based on the fixing of standards for butter by certain countries.

Certain aspects of carbonation as applied to buttermaking, S. C. Prescott and M. E. Parker (*N. Y. Prod. Rev. and Amer. Creamery, 60 (1925), No. 1, pp. 12, 14, 16–18*).—The preliminary results of studies of the manufacture of carbonated butter are reported from the Massachusetts Institute of Tech-

nology. Commercial carbon dioxide coming directly from the container was found to be practically bacteriologically sterile in several trials. The air in an establishment where carbonated butter was being manufactured, as well as the air in the churn, was found to contain considerable numbers of bacteria and dust particles, but by driving the air through the churn with carbon dioxide the numbers of dust particles were reduced.

Bacteriological determinations were made of samples of cream and of the buttermilk and butter from the same cream made after dividing it into two portions, the one being churned in air and the other in a carbon dioxide atmosphere. The results indicated that the carbonated butter had a lower bacterial count than butter churned in the air, but the carbonated buttermilk contained larger numbers of bacteria. It was further found that carbonation of air-made buttermilk increased the bacterial content more than aeration of carbonated buttermilk.

The authors believe that carbonation inhibits the growth of bacteria normally present in butter, but is favorable to those normally found in buttermilk.

The salting of Camembert in brine [trans. title], P. Vaslin (*Lait, 5 (1925), No. 42, pp. 113–116, pl. 1*).—The salting of Camembert cheese by dipping it in a brine has been found very satisfactory. The cheeses are placed on wooden racks and immersed for from 30 to 40 minutes and occasionally an hour in a saturated salt solution made up to about 260 gm. of salt per liter of water. The necessity of keeping the brine solution clean is pointed out.

The manufacture of ice cream, H. F. DePew and S. W. Dyer (*N. H. Univ. [Agr.] Ext. Bul. 27 (1925), pp. 35, figs. 4*).—Popular directions are given.

***The influence of overrun and temperature on shrinkage of ice cream* when dipped in quart containers,** R. C. Fisher and H. F. Judkins (*Creamery and Milk Plant Mo., 14 (1925), No. 3, pp. 75–78*).—In studying the effect of the overrun and storage temperature on the shrinkage of ice cream in dipping, batches containing 10 per cent of butterfat, 11 per cent of serum solids, 15 per cent of sugar, and 0.5 per cent of gelatin were frozen to have a calculated overrun at the freezer of 80, 90, 100, and 110 per cent.

Four cans were frozen in each batch, one of each being stored for approximately 48 hours at —2, 2, 4, and 12° F., respectively. The overrun as calculated in the cans at the time of dipping was 81.86, 86, 93, and 100 per cent in the respective batches. Four different operators dipped the ice cream into quart containers. It was shown that as the overrun increased the shrinkage at the time of dipping increased from 26.74 per cent to 49.23 per cent, with increases in the overrun from approximately 80 to 100 per cent. The shrinkage in dipping was greater at the higher temperatures. This shrinkage was found to be about 50 to 55 per cent, irrespective of the original overrun.

Recent studies on gelatin for ice cream manufacturer, P. H. Tracy (*Creamery and Milk Plant Mo., 13 (1924), No. 12, pp. 80, 82*).—Determinations of the bacterial content of a number of samples of gelatin at the Illinois Experiment Station showed considerable variability, but the counts were usually low. Different samples of the same brand tended to be uniform in bacterial content. Heating gelatin to from 140 to 160° F., as in dissolving it or pasteurizing, tended to lower its bacterial content materially. Storage of gelatin in damp places and at relatively high storage temperatures tended to increase the numbers of bacteria. The use of unclean kettles also slightly increased the numbers of bacteria added to the ice cream.

Gelatin as a source of bacteria in ice cream, J. M. Brannon and P. H. Tracy (*Jour. Dairy Sci., 8 (1925), No. 2, pp. 115–126*).—Essentially noted above.

VETERINARY MEDICINE

The practical elements of exotic veterinary pathology, H. Velu and J. Barotte (*Eléments Pratiques de Pathologie Vétérinaire Exotique. Paris: Émile Larose, 1924, pp. III+436, figs. 19*).—Part 1 of this work (pp. 1–135) deals with the general technique of biological diagnosis in veterinary medicine, and part 2 (pp. 137–422) with the application of biological diagnostics to the principal affections of animals in the French colonies.

Veterinary hygiene.—III, Infectious diseases of farm animals, M. Klimmer (*Veterinärhygiene.—III, Seuchenlehre der Landwirtschaftlichen Nutztiere. Berlin: Paul Parey, 1925, 4. ed., rev. and enl., vol. 3, pp. X+538, pls. 2, figs. 104*).—A fourth edition of volume 3 of this work (E. S. R., 52, pp. 480, 866).

Reports of proceedings in Northern Ireland under the Diseases of Animals Acts with returns of the exports and imports of animals for the years 1922 and 1923, F. W. Emery (*North. Ireland Home Off., Rpts. Proc. Diseases Anim. Acts* [*etc.*], *1922–1923, pp. 36*).—These reports include accounts of the occurrence of infectious and parasitic diseases of livestock.

Variations in body temperatures observed in normal subjects, E. H. Cluver (*So. African Jour. Sci., 20 (1923), No. 2, pp. 380–386*).—Data on man and animals are included in the studies here reported.

Pathologic changes in lung from use of mercurochrome—220 soluble, H. J. Corper (*Jour. Amer. Med. Assoc., 85 (1925), No. 4, pp. 256–262, figs. 10*).—A review of previous investigations conducted with mercurochrome–220 soluble is followed by a report of experimental work with the dog. The author finds that when from 0.5 to 2 per cent solutions are injected subcutaneously, intratracheally, and into the pleural cavity, profound pathological tissue changes take place.

A note on the life histories of Ascaris lumbricoides and Ascaris suilla in South Africa, A. Porter (*So. African Jour. Sci., 20 (1923), No. 2, pp. 347–350*).—The author reports upon observations of the development of the ova of *A. lumbricoides* from human feces and *A. suilla* from pig feces, in petri dishes and in white rats to which the ova were fed, at Johannesburg, at an altitude of nearly 6,000 ft. The results were essentially the same as those obtained by Stewart, previously noted (E. S. R., 39, p. 286).

Studies on certain characteristics of Clostridium chauvei and Clostridium edematis, J. P. Scott (*Jour. Bact., 10 (1925), No. 3, pp. 265–313*).—In this contribution from the Kansas Experiment Station, the author reports upon investigations of the cultural characteristics, pathogenicity, production of aggressive substances, and immunization, and of serological tests made with a view to discovering characteristics that may serve to differentiate *C. chauvei* from allied anaerobic spore-forming rods. Thirty-six strains of *C. chauvei* were used in the more important tests, 17 in the cultural tests, and a smaller series for some of the less important determinations.

"It has been shown that antiblackleg serum from horses protected guinea pigs against *C. chauvei* strains isolated from typical cases of blackleg disease. These strains did not grow in 2 per cent glucose infusion agar. *C. chauvei* strains were shown to be typically single Gram-positive rods, producing occasional oval subterminal spores. *C. edematis* strains were seen to be typically chain-forming types showing numerous filamentous rods. Some strains of *C. edematis* produced a predominance of paired organisms, in a number of which the elements formed a sharp angle one with another. *C. chauvei* strains were shown to be much less active biochemically than the *C. edematis* strains, *C.*

chauvei only fermenting carbohydrates in the presence of unheated serum, while the *C. edematis* strains fermented carbohydrates in a greater number of media. *C. chauvei ferments a restricted number of carbohydrates only*, while the *C. edematis* types ferment most carbohydrates."

Studies on the migratory habits of certain nematode larvae, B. L. DANHEIM (*Amer. Micros. Soc. Trans., 44 (1925), No. 1, pp. 14–23, figs. 13*).—This is a contribution from the Kansas Experiment Station, where feeding experiments with ascarids, heterakids, and oxyurids were conducted. All the experiments indicated that the larvae of nematodes belonging to the family Ascaridae have the migratory habit, and that heterakid larvae have a tendency to migrate. Larvae of the Oxyuridae apparently do not have the migratory habit. A list of 17 references to the literature cited is included.

Some cultural characters of Bacillus abortus (Bang), with special reference to CO_2 requirements, T. SMITH (*Jour. Expt. Med., 40 (1924), No. 2, pp. 219–232*).—The author finds the relative absence of saprophytism in freshly isolated strains of *B. abortus* to be conveniently measured by inoculating a series of agar tubes with successive dilutions of culture and sealing the tubes. The appearance of films of growth is delayed from 3 to 17 days and suppressed with the increase in the dilutions. As many as 100,000 bacteria per square centimeter of agar surface are suppressed. When the confined air contains CO_2 in a concentration as low as 0.25 per cent and up to 10 per cent, the inhibition and suppression do not occur. Concentrations down to 0.1 per cent are still capable, even though in a slightly retarded manner, of bringing high dilutions into growth. In all cases the resulting growth was remarkably vigorous when compared with that in sealed tubes.

The use of rabbits in the study of infectious abortion, B. L. WARWICK, E. M. GILDOW, and F. B. HADLEY (*Jour. Infect. Diseases, 37 (1925), No. 1, pp. 62–67*).—Inoculation of rabbits is adaptable to the study of the abortion disease from several angles. It should prove of value in the study of immunity production. The typing of *Bacterium abortus* might be based on the results of inoculation of rabbits. The virulence of the organism under consideration can be quickly, definitely, and economically determined. The virulence so determined should be more accurate and of more value than that determined by lesions produced as a result of guinea-pig inoculation. Other organisms have been incriminated as the cause of abortion in cattle and horses (E. S. R., 36, p. 780; 45, p. 180). The variations in resistance to *B. abortus* as shown by individual females of the same species suggest the probability of genetic differences in the germ plasm. Using this method of testing the females, it should be possible to determine whether strains of animals can be produced which are resistant to *B. abortus*.

Mixed infection in guinea-pigs with Bacterium abortum and Mycobacterium tuberculosis, A. F. SCHOENFELD and C. M. CARPENTER (*Jour. Infect. Diseases, 37 (1925), No. 1, pp. 68–74*).—Agglutinins specific for *B. abortum* were developed in guinea pigs when the latter received simultaneously injections with cultures of *B. arbortum* and *M. tuberculosis*. When either organism was injected several days prior to the other, or when an extract of tissues affected with tuberculosis and abortion disease, respectively, was injected into guinea pigs, specific agglutinins for *B. abortum* were also developed.

B. abortum was recovered in pure culture from the livers, spleens, and epididymes of guinea pigs when a mixed infection with the Bang organism and tubercle bacillus had been produced as mentioned above. *B. abortum* grew on a 1 per cent glucose-agar which was unsuitable for the development of *M. tuberculosis*.

The presence of the two infections did not change the gross appearance of the tissues from that observed in guinea pigs suffering from generalized tuberculosis. The mixed infection results in a shorter disease course and is more fatal than tuberculosis alone.

Flies do not disseminate the virus of foot-and-mouth disease [trans. title], C. LEBAILLY (*Compt. Rend. Acad. Sci.* [*Paris*], *179* (*1924*), *No. 21*, *pp. 1225–1227*).—Experiments conducted by the author with both *Muscina stabulans* Fall. and the house fly have led to the conclusion that they play no part in the spread of foot-and-mouth disease.

East Coast fever: The theory of latency, E. W. BEVAN (*Rhodesia Agr. Jour.*, *22* (*1925*), *No. 3*, *pp. 337–344*).—A paper presented at a meeting of the Royal Society of Tropical Medicine and Hygiene in December, 1924.

The distribution of Brucella melitensis, A. C. EVANS (*Abs. Bact.*, *9* (*1925*), *No. 1*, *p. 23*).—This is the author's abstract of a paper presented at the annual meeting of the Society of American Bacteriologists held at Washington in December, 1924.

Agglutinin absorption tests made of a large number of strains of Brucella from human and caprine infections known as Malta fever and from bovine, porcine, and equine infections known as contagious abortion, received from all sections of the United States, from Mediterranean countries, and from central and northern Europe, resulted in their falling into eight groups, three of which contained only one strain each. Two of the groups were found to be common in the United States, one of which is known as *Bacillus abortus* (Bang) and the other as *Micrococcus melitensis* (Bruce). It is pointed out that the only method by which the strains of these two groups may be differentiated is by the agglutinin absorption test. By this method the differentiation is slight, for saturation of the serum of either type with an antigen of the heterologous type will remove from 85 to 90 per cent of agglutinins specific to the homologous antigen.

"The histories of the strains in our collection show that the serological group which is characteristic of human and caprine infections causes contagious abortion in domestic animals, and the serological group which is characteristic of bovine and porcine infections causes typical Malta fever in man. It is therefore illogical to designate the two serological groups by different specific names. Until 1924 there were no authentic cases of human Malta fever due to infection with the bovine (*abortus*) type of strain on record. During the current year reports have been made of three such cases in widely separated parts of this country and four cases in South Africa. The serological grouping of strains from Mediterranean countries compared with strains from northern and central Europe and the United States was distinct. The *abortus* type was not found among the Mediterranean strains, and, of the four serological types found to be common in Mediterranean countries, only one was found in other countries. This geographical distribution is of interest in view of the severe type of the disease in Mediterranean countries."

The mode of action of Bayer 205 on trypanosomes, I. J. KLIGLER and I. WEITZMAN (*Ann. Trop. Med. and Parasitol.*, *19* (*1925*), *No. 2*, *pp. 235–241*).—Experiments here reported show that, contrary to previous belief that Bayer 205 exerts little trypanocidal action in vitro, it appears that the drug has a marked effect on the cell so that a dilution of 1:1,600 is sufficient to destroy the virulence of the organisms. It appears that in rabbits, at least, the therapeutic, abortive, and prophylactic doses are similar.

A new vaccination prophylaxis in tuberculosis, A. BOQUET (*Nation's Health*, *7* (*1925*), *No. 2*, *pp. 89, 90*).—This is a discussion of the Calmette-

Guérin method of vaccination against tuberculosis (E. S. R., 52, p. 282), particularly as applied to the prophylaxis of children.

Some studies of Pasteurella boviseptica, G. E. JORGENSON (*Cornell Vet., 15 (1925), No. 3, pp. 295–302*).—As a result of a series of experiments the author concludes that a considerable percentage of normal cattle (about 15 per cent in the cattle studied) carry *P. boviseptica* in their upper respiratory tracts.

"These organisms are not ordinarily incompatible with the health of the animal and seemingly do no harm, but under certain conditions they are capable of changing from potential to active pathogens. The influence which seems to predispose animals to an attack of this disease appears to be any condition which tends to lower the natural resistance of the host, such as cold, fatigue, etc. All three of the types of *P. boviseptica* described by Jones from clinical cases of hemorrhagic septicemia were found in normal cattle. A heretofore undescribed type was isolated which differed from the three types described by Jones in that it was able to ferment dulcite, grew more luxuriantly, was highly virulent, and could not be agglutinated by serum prepared against any of the other three types. Feeding a large dose of *P. boviseptica* to a healthy cow may result in a general infection, especially if the animal's resistance has been lowered by fatigue or cold."

Hydropic stages in the intestinal epithelium of new-born calves, T. SMITH (*Jour. Expt. Med., 41 (1925), No. 1, pp. 81–88, pls. 3*).—The investigations here reported led the author to conclude that there occurs in the small intestines of a large percentage of calves up to and including the third day a hydropic condition of the epithelium. This manifests itself in the form of a large vacuole or vesicle usually under the top plate of the epithelial cell. More rarely a number of smaller vesicles or vacuoles replace it. These may break away from the cell and float free when bits of the fresh mucosa are gently compressed under a cover glass. The vesicles probably contain coagulable protein. This condition has its origin in late intrauterine life. It involves the lowest third of the small intestine and extends upward as far as the duodenum in some cases. It is not a necessary forerunner of the early diarrhea or scours, and its relation to this disease is not defined. It may or may not be accompanied by a fat stasis of the upper third of the small intestine. Frequently associated with it is coagulable protein in the contents of the ileum.

A contribution to the knowledge of infectious abortion of bovines [trans. title], H. LUDWIG (*Schweiz. Arch. Tierheilk., 66 (1924), Nos. 18, pp. 519–531; 19, pp. 555–570; 20, pp. 591–606 figs. 12*).—This disease is said to be very widely distributed in the Canton of Freiburg, Switzerland. The immunization of infected herds with a live vaccine has given successful results.

Infectious abortion (seventh report).—How cattle owners may have their herds tested (*Connecticut Storrs Sta. Bul. 130 (1925), pp. 289–293*).—This seventh report (E. S. R., 53, p. 80), prepared by the departments of animal diseases and dairy husbandry, announces that tests of herds for infectious abortion will be made for a fee of from 25 to 75 cts. per sample. Directions are given for the drawing of the blood samples and their shipment.

Contagious abortion in ewes, T. J. BOSWORTH and R. E. GLOVER (*Vet. Jour., 81 (1925), No. 601, pp. 319–334*).—This is a report of studies at the Institute of Animal Pathology, Cambridge, during the course of which several outbreaks of contagious abortion in ewes were observed which were due to a type of organism not previously associated with the disease in England. Microscopic examination of fresh preparations from the body fluids of the fetus or the cotyledons resulted in the finding of a large number of actively

motile rod-shaped organisms. In examinations of a large number of aborted lambs the organism was obtained in pure culture from the heart blood and from all the organs of the body. The same organism has been isolated from the cotyledons and the uterine exudate. Its chief characteristics are described as follows:

"A Gram-negative bacillus exhibiting a marked degree of pleomorphism. In freshly isolated young cultures it appears as a short oval bacillus. In older cultures, in addition to the foregoing, more definitely rod-shaped forms and even short filaments are seen. Growth takes place on all ordinary media under both aerobic and anaerobic conditions, although it is rather more luxuriant in the presence of oxygen. On the surface of agar minute transparent colonies may be seen after incubation at 37° C. for 15 to 18 hours, and at this stage present the appearance of a culture of streptococci. With further incubation they rapidly increase in size, until by the forty-eighth hour they may have attained a diameter of 3 mm., and are rounded, semiopaque, and slightly raised. In broth a uniform turbidity is first produced, and later there is a tendency to sedimentation. No film develops at the surface. In glucose broth the growth is more abundant, and a few bubbles of gas are produced. In shake cultures in glucose agar small lenticular colonies develop throughout the medium, which becomes split by the formation of gas. There is no growth on potato. Gelatin is slowly liquefied. No indol is produced. Slight blackening of lead acetate agar occurs. The organism ferments glucose, maltose, levulose, and mannite, with the formation of a small amount of gas. Slight fermentation of dulcite is noted with some strains after 4 days' incubation. Lactose, saccharose, salicin, inulin, sorbite, arabinose, inosite, and glycerin are not fermented. There is no change in litmus milk after 10 days."

The agglutination test appears to furnish a reliable method of determining the existence of infection in a flock. The sera of ewes which have aborted agglutinate the organism in dilutions varying from 1 in 50 to 1 in 1,000. The investigations led the authors to consider the organism that they isolated to be a cause of abortion on an extensive scale, since it was isolated in pure culture from several natural outbreaks, and, moreover, was proved to be capable of producing abortion in pregnant ewes which were artificially infected, although all ewes that become infected do not abort.

Stachys arvensis: A cause of staggers or shivers in sheep, H. R. Seddon (*Agr. Gaz. N. S. Wales*, 36 (1925), No. 5, pp. 355–358).—The author reports upon experimental work which has demonstrated the toxic action of *S. arvensis* in New South Wales. It is stated that further work is in progress to determine why the effects of the weed vary so greatly.

A new coccidium from the sheep [trans. title], A. Spiegl (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 28 (1925), No. 1, pp. 42–46, pl. 1).—Under the name *Eimeria intricata* the author describes a coccidium not previously known, which was observed in two herds of sheep in the districts of Wanzleben and Thüringen.

Infection of the hog by Trypanosoma congolense-pecorum [trans. title], R. Van Saceghem (*Compt. Rend. Soc. Biol.* [*Paris*], 93 (1925), No. 20, pp. 71, 72).—The author points out that he has previously described the course of infection due to this trypanosome in the ox, goat, sheep, rabbit, guinea pig, and dog.[3] In the present paper he reports that in the region of Ruanda, Belgian Kongo, where trypanosomiasis due to *T. congolense-pecorum* is transmitted by Stomoxys, he has never found swine to be naturally infected by this pathogenic trypanosome. When the native race of swine is inoculated with it in

[3] Compt. Rend. Soc. Biol. [Paris], 91 (1924), No. 37, pp. 1455, 1456.

blood from the bovine, a chronic benign infection is produced and recovery follows.

The pulse rate in infectious and symptomatic anemia of the horse [trans. title], J. Nörr (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 28 (1925), No. 1, pp. 1–22, figs. 11*).—The author finds that in infectious anemia the pulse rate averages from 10 to 15 beats per minute higher than in symptomatic anemia.

Poultry diseases (*North Carolina Sta. Bul. 247 (1925), p. 36*).—It is reported that a vaccine for fowl typhoid, known in Europe as Klein's disease and caused by *Eberthella sanguinarium*, has been prepared in the poultry laboratory, and that its use during the past three years has stopped 41 outbreaks in flocks containing 4,300 birds. The pneumonia germ, *Diplococcus pneumonia capsulatus*, was for the first time isolated from fowls during an epidemic which occurred in a fattening plant and which destroyed 2,600 birds within 10 days.

Bacillary white diarrhea; fatal speticemia of chicks, E. L. Brunett (*Cornell Vet., 15 (1925), No. 3, pp. 303–314, figs. 8*).—This is a summary of information, with references to the literature.

Control of bacillary white diarrhoea, 1924–1925, P. E. Bransfield (*Massachusetts Sta. Control Ser. Bul. 31 (1925), pp. 7*).—This report of control work with white diarrhea is in continuation of reports during the preceding four years (E. S. R., 52, p. 484). During the 1924–25 season 66,503 fowls, or 6,868 more than during 1923–24, were tested for bacillary white diarrhea, and the percentage of infection in the flocks tested was reduced from 6.53 to 2.94. Seventy-nine bacillary white diarrhea-free flocks were established, this being 41 more than the preceding year. Record of day-old chicks purchased from 25 disease-free flocks show that over 94 per cent of the chicks lived. The results show marked progress in the work and are considered to give grounds for hope of ultimate eradication of the disease.

Combating blackhead, F. B. Headley, E. W. Knight, and L. E. Cline (*U. S. Dept. Agr., Dept. Circ. 352 (1925), pp. 24, 25*).—A brief account of the occurrence of this disease in turkeys at the Newlands Reclamation Project Experiment Farm, near Fallon, Nev., and means being taken in combating it. Directions for the administration of a tobacco decoction in the treatment for worms in poultry are included.

Encephalitozoon cuniculi as a kidney parasite in the rabbit, T. Smith and L. Florence (*Jour. Expt. Med., 41 (1925), No. 1, pp. 25–35, pls. 3*).—This is a report of the studies of a spontaneous epidemic of nephritis among young rabbits associated with a protozoan parasite, which has been under observation in certain breeding stock since 1918. *E. cuniculi*, tentatively classed among the microsporidia, is a parasite of the epithelial cell, provoking no immediate host reactions.

The inhibitory effect of acridine on the sporogony of a coccidium (Eimeria stiedae), P. A. Lewis (*Jour. Expt. Med., 40 (1924), No. 2, pp. 263–267*).—The author finds the development or ripening of the oocyst of the coccidium of the rabbit to be prevented by acridine hydrochloride, provided the cysts are exposed to the action of the chemical before development has started. After sporoblasts are formed, acridine does not prevent further development. Many other substances, some of them known to be active against certain protozoan parasites, have no influence on the ripening of the oocysts of the coccidium.

AGRICULTURAL ENGINEERING

The Papago country, Arizona, K. BRYAN (*U. S. Geol. Survey, Water-Supply Paper 499 (1925), pp. XVIII+436, pls. 27, figs. 41*).—The results of a geographic, geologic, and hydrologic reconnaissance of this area are presented, together with a guide to desert watering places and a preface by O. E. Meinzer.

Determinations of Kutter's n in 15- and 18-in. pipe sewers, C. W. SHERMAN (*Engin. News-Rec., 95 (1925), No. 11, pp. 434–436*).—Experiments are reported from which it is concluded that as a rule *n* should be taken at not less than 0.015 in sewer-pipe design, especially when allowance for deposits and for resistance to flow resulting from enlargements at manholes, changes of direction, entrance of branches, etc., is considered.

[Drainage experiments at the North Carolina Station] (*North Carolina Sta. Bul. 247 (1925), pp. 39–41, fig 1*).—It is reported that gaugings over a 7-year period on a typical dredged Piedmont creek, having a watershed area of 60 square miles, indicated that the drainage factor used in computing channel sizes for drainage improvements should be increased to 1 in. per 24 hours as against 0.5 to 0.75 in. formerly used in districts of this type. The ratio of run-off to rainfall was found to range from 33 to 54 per cent, with an average of 45 per cent.

Data on the maintenance of drainage canals in the Coastal Plain indicated that where the depth of water in the canals is considerable throughout the year, there is little growth in the channel. Where the canal is large for the amount of water carried, resulting in a normal shallow depth of flow, conditions are favorable for a heavy growth of vegetation. The cost of cleaning both banks by hand labor was found to be $54 per mile four years after original construction, and for recleaning two years later, on the same labor basis, the cost was 84 per cent of the above. The cost of clearing the channel of all plant growth four years after the construction was $83 per mile and 25 per cent greater on the some labor basis two years later. The most favorable season for this work was found to be between June 15 and August 1.

Records of discharge from farm tile drainage systems indicated that a run-off coefficient of from ⅛ to ⅜ in. per 24 hours will give satisfactory results under average conditions of soil and spacing of laterals. Where surface-water inlets are used this should be increased to ½ in. Studies of the effect of spacing and depth of tile drainage laterals showed that a spacing of 120 ft. with a depth of 3½ ft. may be adopted for the more open Coastal Plain soils, with the same beneficial results and a saving in cost over the spacing of 100 ft. with a 3-ft. depth, as formerly used. It was further found that silt will not be deposited in 4-in. laterals when laid in a sandy clay subsoil on a 0.3 per cent grade with good workmanship. The drainage from the ends of tile laterals was found to be as good as from the sides. Experiments in substituting tile of large diameter for open ditches showed that tile sizes up to 18 in. in diameter, when supplemented by a sufficient lateral system and surface-water inlets, are practical in the State.

Studies of ground water level showed that the character of the soil rather than topographic features is the determining factor in the rise and fall of the ground water surfaces under similar drainage conditions. The ground water surface between tile lines in a level soil of uniform texture was found to rise in a smooth curve from the tile lines to a point midway between them. This curve may be very irregular in a soil of irregular texture. The rate of drop of the ground water level midway between tile lines at a 3-ft. depth in Norfolk sand averaged from 1 to 1.7 ft. per day in the surface foot and from 0.5 to 0.75 ft. in the second foot. The ground water surface between the widely spaced

drains commonly used on the muck soils of the eastern Coastal Plain was found to be comparatively flat, and the rate of drop below the surface 18 in. very slow. It was further found that a 1-in. rainfall will be absorbed by an open soil drained by tile at a depth of 3 ft. without any run-off, where the ground water surface is at the level of the drains prior to the rain.

Handbook on building walls with rammed earth, E. W. COFFIN and H. B. HUMPHREY (*Washington, D. C.: H. B. Humphrey, 1924, pp. 99, figs. 14*).—Practical information on the use of rammed earth, or pisé de terre, in building construction is presented in this handbook.

Fence-post test—Cleveland, Texas, C. F. FORD (*Bul. Amer. Ry. Engin. Assoc., 26 (1924), No. 270, pp. 76–101, figs. 18*).—The data from inspections of a service test of fence posts treated with various preservatives from early in 1912 up to and including May, 1924, are presented in detail.

Handling explosives on the farm, A. J. MCADAMS (*Missouri Agr. Col. Ext. Circ. 158 (1925), pp. 16, figs. 21*).—Practical information on the handling and use of explosives on the farm is presented.

Colours and varnishes, C. COFFIGNIER, trans. by A. HARVEY (*London: Scott, Greenwood & Son, 1925, pp. VII+258, figs. 31*).—This book contains general information, largely of a technical nature, on the subject.

Production methods in a tractor plant (*Machinery, 32 (1925), No. 1, pp. 32–35, figs. 10*).—In a second article on methods used in the manufacture of farm machinery, descriptions are given of some of the more unusual operations performed in tractor manufacture.

1925 cooperative tractor catalog (*Kansas City, Mo.: Impl. Trade Jour. Co., 10. ed., 1925, pp. 256*).—This is the tenth edition of this catalogue containing the specifications for the majority of farm tractors on the market and including a directory of tractors, tractor accessories, and power farming machinery.

Electricity in Oregon agriculture (*[Corvallis]: Oreg. Com. on Relation of Elect. to Agr., 1925, pp. 7*).—The organization of the work on the application of electricity to agriculture in Oregon is briefly outlined, and the results of a field survey are briefly presented. The survey covered 10 representative areas in the State and included 188 farms. An average of 4.17 users per mile of distribution line was found, and it was established that 26 per cent of the farmers on these lines were not using current, primarily because of lack of ability to finance the undertaking. The most extensive use of electricity on farms was for lighting and household conveniences.

It is concluded that in the last analysis the price of current per kilowatt hour will depend largely upon the volume of use, and that aside from household appliances, pumps, and some dairy machines the agricultural equipment at present available is not adapted to the electric drive.

An improvement in the utilization of wind power for the production of electrical energy [trans. title], H. NOTTELMANN (*Elektrotech. Ztschr., 46 (1925), No. 11, pp. 365–368, figs. 6*).—A new wind-power machine for the production of electrical energy is described and illustrated, and data from its operation are included. It is a completely automatic high speed machine, generating 600 kw. at an average wind velocity of 6 meters per second (13.4 miles per hour), which is increased to 800 kw. at a wind speed of 8 meters per second. The revolution speed of this plant is from 6 to 8 times that of ordinary windmills and wind moats.

Influence on fire safety of defective electric installations, especially in agriculture [trans. title], K. SCHNEIDERMANN (*Elektrotech. Ztschr., 44 (1923), No. 16, pp. 353–358, figs. 20*).—Descriptions are given of a number of instances

of poor construction and materials and defective installation of electrical equipment in farm buildings in Germany which have resulted in fires.

A strong objection is raised to the practice of leading wires through the interior of farm buildings, from barn to stable, and through hay lofts and root stores. Cases are cited of the destruction of iron conduits and cable insulation by the ammoniacal vapors from stalls and pigsties.

It is concluded that all cables, switches, fuses, branch boxes, and motors should be outside of the main farm buildings, in locked boxes or rooms, with the openings for shafts or belts from motors made as small as possible or provided with covers to be closed when not in use. The wiring to the lamps should be led in through the side walls as directly as possible and not through the roof.

Heating appliances for flue-curing tobacco, D. D. DIGGES (*Canada Dept. Agr. Pamphlet 51, n. ser. (1925), pp. 13, figs. 6*).—Studies at the Harrow Experimental Station are reported which showed that in the curing of tobacco single furnaces were unsatisfactory due to their inability to distribute the heat evenly on all sides of the kiln. Flue tobacco was cured successfully for three seasons, using high pressure steam from a 30-h.p. portable boiler as a source of heat. The fuel costs were lower and the curing more uniform with this system.

Poultry house construction, A. L. WALKER (*N. Mex. Agr. Col. Ext. Circ. 85 (1925), pp. 35, figs. 23*).—Practical information on the planning and construction of poultry houses for New Mexico conditions is presented, together with drawings and bills of material.

Farm poultry houses, D. H. HALL (*Clemson Agr. Col., S. C., Ext. Bul. 69 (1925), pp. 21, figs. 17*).—Practical information on the planning and construction of poultry houses adapted to South Carolina conditions is presented, together with working drawings and bills of material for particular types.

The reel mash feeder, D. C. KENNARD (*Ohio Sta. Bimo. Bul., 10 (1925), No. 7, pp. 114–116*).—A description is given of this mash feeder, together with a bill of materials.

Protection of small water supplies used by railroads, C. R. KNOWLES (*Bul. Amer. Ry. Engin. Assoc., 26 (1924), No. 270, pp. 131–142, figs. 9*).—Data on the protection of small water supplies are presented, together with several drawings of typical methods of water supply protection which may be of value in rural sections.

Factors influencing the bacterial flora of an Imhoff tank, M. HOTCHKISS (*Amer. Jour. Pub. Health, 15 (1925), No. 8, pp. 702–704, figs. 2*).—In a contribution from the New Jersey Experiment Stations, studies on the fluctuations in bacterial flora in an Imhoff tank during an extended period of time and on the influence of changes in temperature on numerical changes are reported.

None of the results obtained suggested a relation with seasonal variations in temperature. It was found that the bacteria increase in the liquid of an operating tank and decrease during a resting period. It is suggested that there are various phases in the digestion of the material in the tanks in which a succession of bacteria take a predominating part, and that variations in the manner of operating the tanks influence the general bacterial flora and tend to obscure any seasonal variations which may occur.

RURAL ECONOMICS AND SOCIOLOGY

Farm management problems in the northeastern dairy belt, E. G. MISNER (*Jour. Farm. Econ., 7 (1925), No. 2, pp. 251–273*).—The returns for labor and capital on 531 dairy farms in New York State for the year ended

April 30, 1922, data which have largely been previously noted (E. S. R., 53, p. 391), are discussed in this paper. Some of the problems confronting the dairyman in this region are the size of the dairy farm business, the selection of the most profitable intensive crops, shifting the system to keep in adjustment with the changing markets resulting from expanding city population, obtaining price premiums, and increasing the net rate of production or least cost and greatest profit practices.

Centralized management of a large corporate estate operated by tenants in the wheat belt, W. H. BAUMGARTEL (*U. S. Dept. Agr., Dept. Circ. 351 (1925), pp. 35, figs. 12*).—This bulletin describes the development and the system of management of the Amenia and Sharon Land Company (E. S. R., 51, p. 890).

Approximately 55 square miles of land are owned by this company, the area being subdivided into 65 tenant holdings in addition to the area occupied by headquarters buildings and experimental farm.

According to the averages for 16 tenant farms for which continuous records are available from 1896 to 1920, an average net return of $1.84 per acre was yielded the company, or a little more than 3.8 per cent on the current value of the investment. Omitting that part of the valuation represented by the buildings and other surface improvements, there was realized a net increment in the value of real estate of $86.58 per acre, or 18.7 per cent of the estimated valuation of the real estate in 1896. The combined increment and net return not excluding taxes averaged 30.1 per cent on the original valuation. It is pointed out, however, that the period 1896–1920 was an unusually favorable one from the standpoint of both net returns and increase in the valuation of farm real estate.

Of 32 tenants for whom reports as to the net gain or loss since taking up one of the company's holdings were obtained, 28 made gains ranging from $350 to nearly $15,000. The average net gain of the 32 tenants was $3,648, the average period of occupancy having been about 7 years, ranging, however, from 1 to 23. Reports obtained from 47 tenants who had left these farms showed that 42 were still farming, 32 of whom had become owners or owners additional.

An agricultural economic survey of Rockwall County, Texas, L. P. GABBARD (*Texas Sta. Bul. 327 (1925), pp. 161, figs. 56*).—This bulletin reports a survey of the farm operations for the year 1922 on 500 farms, the conditions described being regarded as typical of the black land cotton farming belt.

It was found that 90 per cent of the land in the farms studied was improved, and of this 93 per cent was devoted to crops, of which cotton made up 67 per cent. Of the investment in farm capital 94 per cent was in land and permanent improvements and 6 per cent in machinery and livestock. Of the 500 farms, 450 hired labor at an average expenditure of $346.38 per farm. Loans for various purposes amounted to an average of $1,111.34 per farm. Of the amount borrowed 71 per cent was used for buying land and the remainder for making a crop and for living expenses. The net income per acre was found to be closely correlated with a number of factors, of which the yield of lint cotton per acre was important.

[Agricultural conditions, livestock and dairy production, and marketing practices on the Newlands (Nev.) Reclamation Project Farm], F. B. HEADLEY, E. W. KNIGHT, and L. E. CLINE (*U. S. Dept. Agr., Dept. Circ. 352 (1925), pp. 1–5, 20, 21, 25, 26*).—The discussion of agricultural conditions is based upon returns from the annual censuses taken on the project. Fluctuations in the annual acreage of alfalfa, potatoes, and sugar beets are accounted for, and the acreage, yields, and farm values of the leading crops in 1922 and 1923 and during the period 1912–1923 are tabulated, as are also the numbers

of livestock on the project from 1914 to 1923, inclusive, and per farm and per 100 acres in 1923. Notes are given showing the numbers of swine and sheep and the extent of dairying, also the marketing of turkeys and eggs.

The progress of the land problems in the United States, especially in the light of congressional debates, K. NAKASHIMA (*Jour. Col. Agr., Hokkaido Imp. Univ., 13 (1924), No. 2, pp. 67–215*).—This paper treats of the disposition of the public domain and private lands to citizens of the United States, questions arising in connection with the acquisition of land by native Indians and Asiatic aliens, and the organization and administration of public and private land settlements in the United States. An extensive bibliography is provided.

The farms of Brie, P. PARMANTIER (*Fermes de Brie. Lagny (Seine-et-Marne): Emmanuel Grevin, [1924], pp. VIII+9–141*).—Numerous customary and legal terms and conditions of farm leasing characteristic of a farming region in the vicinity of Paris are described.

Cost of milk production (*North Carolina Sta. Bul. 247 (1925), p. 21*).—The findings of a three years' investigation of this matter by the station cooperating with the U. S. Department of Agriculture are summarized, unit requirements for the production and distribution of 100 lbs. of milk being listed by seasons.

Costs and profits of sheep on irrigated farms, E. L. POTTER and R. WITHYCOMBE (*Oregon Sta. Circ. 62 (1925), pp. 15*).—The financial considerations of sheep raising are discussed under the heads of maintenance costs, interest and depreciation, and income. Budgets based upon averages for western irrigated ranches are submitted, which indicate that with lambs at 10 cts. and wool at 40 cts. per pound a farm flock should return to the owner $8 a ton for the hay, $12 an acre rent on the pasture, 8 per cent on investment, 40 cts. an hour for the labor, and 72 cts. a head additional. The possibilities for extra profit as well as for loss in farm sheep are enumerated.

Immigrants and American agriculture, A. E. CANCE (*Jour. Farm Econ., 7 (1925), No. 1, pp. 102–114*).—The following conclusions are reached after a study of data for 1909 and 1919 assembled through the Federal Immigration Commission:

Some of the very best of our farmers are immigrants of the first and second generation. There are no immigrant races that can not make a success of agriculture, provided conditions of settlement and development are right. Agricultural immigrants are good immigrants. It is undesirable to advance the agricultural industry by the importation of cheap labor, either of a temporary or a permanent character that is not easily assimilated. It is much better to develop a high standard of living among ruralists already on the land. Immigrants may be welcomed to agriculture just as immigrants from other industries are welcomed to agriculture when there is apparent need for a larger production or for more laborers in the industry. It is quite useless for any group of agriculturists to attempt to secure a permanent supply of agricultural laborers by the importation of immigrants, first, because of the competition for the services of such immigrants in other industries and, second, because any agricultural laborers worthy of their hire soon develop ambitions to become tenants or farm operators. The permanent development of the agricultural industry can best be conserved by maintaining the present agriculturists or their descendants in a high state of efficiency, with a high standard of living and comfort.

Agricultural credit cooperative associations in the Philippines, J. C. BALMACEDA (*Philippine Bur. Agr. Bul. 40 (1924), pp. 74, pl. 1, fig. 1*).—The history, aims, and provisions of the present rural credit law and related

credit legislation for the Philippines are set forth. Appendixes give statistical information and the texts of acts and regulations and other material.

Has rural credit legislation gone far enough and in the right direction? C. L. BENNER (*Jour. Farm Econ., 7 (1925), No. 1, pp. 84–101*).—Much of the rural credit legislation now in force is regarded as compromise legislation. The Federal Farm Loan Act is thought to have been successful, however, in accomplishing certain ends. The tax exemption feature is open to question. Certain State banking schemes of recent years are held to be dangerous.

The establishment of intermediate credit banks has not enabled the country banks to make loans which they could not safely make before, and the Federal intermediate credit banks will not be able to insure a plentiful supply of credit to the farmers whenever there is a general credit stringency in the country. The author deems it undesirable that agrciultural credit cooperation should be established on a large scale as competitors to local banks. A fuller inclusion of the country banks in the Federal reserve system would make them more efficient credit institutions.

Packing apples in boxes, R. R. PAILTHORP and F. S. KINSEY (*U. S. Dept. Agr., Farmers' Bul. 1457 (1925), pp. II+22, figs. 16*).—The construction and equipment of packing houses and the operations involved in wrapping are set forth, together with a description of styles and counts of packs.

Estimating the quantity of grain in bins, E. N. BATES (*U. S. Dept. Agr., Misc. Circ. 41 (1925), pp. 8, pl. 1*).—A chart designed for use in determining the capacities of bins of all sizes and shapes up to circular bins 23 ft. in diameter and 30 ft. deep is attached to this publication, the text of which describes the chart, giving directions for its use and definitions of terms and formulas.

Relation of cooperative marketing to the adjustment of agricultural production, O. B. JESNESS (*Jour. Farm Econ., 7 (1925), No. 2, pp. 176–195*).—Certain possibilities and limitations of production control by organizations are set forth. It is held that the immediate supply may be influenced by grading, disposal of the surplus, and the manufacture of by-products. Cooperative marketing associations have an important function in the creation of demand. They may influence the production plans of their members by obtaining and interpreting for them adequate current market information, but it is suggested that they should abandon the idea of production adjustment in order to obtain highly profitable prices, undertaking rather a program of reasonable adjustments in order that the consequences of overproduction may be eliminated. A discussion of this paper is contributed by P. L. Miller.

The effect of price fluctuations on agriculture, A. H. HANSEN (*Jour. Polit. Econ., 33 (1925), No. 2, pp. 196–216, figs. 2*).—This paper considers the effect of general price fluctuations on the purchasing power of farm products during the last 130 years and on the economic status of the farmer as a property owner, and reviews the outlook in connection with the present world situation. Trends and the main periods of price movements, principally between 1790 and 1923, are traced, and certain causal relationships between movements are analyzed. The failure of the farmer's income to meet the demands of mortgages on farm lands purchased at high prices is pointed out.

Recent hog prices, J. I. FALCONER (*Ohio Sta. Bimo. Bul. 10 (1925), No. 7, pp. 100, 101, fig. 1*).—The corn-hog ratio in Ohio for the period 1911–1925 is presented graphically, the average appearing to be 11.24. The ratio for the early summer, 1925, is indicated as about normal. Hog production and price data for the period 1922–1925 are briefly presented.

A history of farmers' movements in Canada, L. A. WOOD (*Toronto: Ryerson Press, 1924, pp. 372*).—The author presents his topic in five parts devoted, respectively, to the Grange in Canada since 1872; the Patrons of

Industry, 1889–1902; the Farmers' Association of Ontario, 1902–1907; the rise of grain growers' movements on the prairies, 1898–1912; the launching of the tariff struggle, 1896–1911; and the farmers' movements in more recent years.

The rôle of public agencies in the internal readjustments of the farm, J. D. Black (*Jour. Farm Econ., 7 (1925), No. 2, pp. 153–175*).—This paper deals with the need for continuous adjustment to meet the changes in the circumstances of agricultural production. A number of State agricultural programs are examined.

Four categories into which farm maladjustments fall are defined as wrong choice or balance of enterprises, wrong combination of the cost factors—the "qualitative aspects," wrong methods and practices, and mistakes on the margin—in land utilization. Further, they are classified on the basis of origin as those growing out of the business cycle or resulting from general trends in the price level, special American price trends, and foreign competition. It is held to be fundamental that the individual farmer must be left absolutely free to plant whatever acreage of any crop that he pleases or keep whatever livestock that he pleases, although he usually is not in a position to determine alone what products are best for him to produce, or in what proportions to combine them, or how to combine the cost factors, and he must be supplied with exactly the information he needs. Programs may not be made to fit any particular farm, and most readjustments should proceed slowly.

Studies designed to obtain data bearing upon the problem of the combination of enterprises are recommended, as well as analyses of trends.

Agricultural readjustment in the Corn Belt, C. L. Holmes (*Jour. Farm Econ., 7 (1925), No. 2, pp. 229–250, figs. 2*).—Reviewing some of the factors in the present situation which make adjustment imperative, the author points out that the succession of seasons unusually favorable to high corn yields has induced an abnormal expansion in the production of hogs, which have been a burden to the market and for which the short crop of the current season provides an altogether inadequate support in the way of feed. The beef enterprise is in a most uncertain state, and the market for dairy products is so unsatisfactory as to make further expansion in that enterprise inadvisable. The foreign market for pork has declined, and a continuation of unstable conditions may be expected.

The cost situation represents the projection of the high costs of a period of expansion over into the lower price conditions of depression. It is thought that the immediate modification of the cropping program in the Corn Belt will perhaps take the form of increased substitution of wheat and barley for oats, while soy beans and certain truck crops are likely to be introduced in a supplementary way. A clearer understanding on the part of the Corn Belt farmer of the cycles of over and under production of hogs and a study of greater efficiency in the production and marketing of beef cattle are deemed important. The outline of a long-time program of adjustment includes the items of economic education for the farmers themselves, an improvement in technical knowledge, an intelligent social control of landownership and tenancy, and more intelligent political leadership for agriculture.

World food supply: A selected bibliography, compiled by M. T. Olcott (*U. S. Dept. Agr., Library, Bibliog. Contrib. 9 (1925), pp. VI+68*).—This bibliography, in mimeographed form, has been limited to works which deal with the production, export, import, and consumption of foods; those which describe the sources of foods and the means by which they are brought to us; and those which definitely discuss the relation of agriculture to population. A number of books and a few periodicals are listed first, and further refer-

ences appear, classified according to the country or region with which they deal.

Farmers' incomes and standards of living (*Jour. Farm Econ., 7 (1925), No. 1, pp. 35–51*).—This topic was discussed in two papers before the joint luncheon meeting of the rural section of the American Sociological Society and the American Farm Economic Association, December 29, 1924.

I. *From an economic viewpoint*, M. L. Wilson (pp. 35–40).—It is deemed feasible and desirable that there should be associated with objective standards of farm management and practice within a given area and associated with a particular type of farming objective standards of living and consumption on the part of the farm family. Greater coordination in studies of the source and use of income is to be desired.

II. *From a sociological viewpoint*, D. Sanderson (pp. 40–51).—An adequate standard of living is held to be one which gives the best conditions for the highest development of human living. The question is raised as to whether agriculture will not be compelled to recognize the essential justice of the wage scale and of minimum wage legislation based on a standard of living. Any adequate agricultural policy must give due recognition to the necessity of devoting thoroughgoing scientific research to the processes of consumption.

The family living from the farm, H. W. Hawthorne (*U. S. Dept. Agr. Bul. 1338 (1925), pp. 31, figs. 5*).—This study sets forth the value of the family living derived from the farm in its relation to the cost of living of farm families and to farm receipts and farm, family, and labor incomes. The data used were obtained in connection with farm business surveys conducted in 30 localities in various sections of the United States for the years 1918 to 1922, as well as in investigations of the cost of food, fuel, and house rent to farm families on 950 farms in 1913 and 1914 in 14 localities in as many States and of the cost of living in farm homes of 2,074 farm families from 1919 to 1923 in 6 localities.

It is indicated that house rent made up 36 per cent of the value of the family living from the farm, fuel 3, and food 61 per cent. It was higher in 1918 and 1919 than in 1921 and 1922, almost entirely as a result of price levels. In general, it was more for the large farms of a locality than for the small ones. With only one exception families of 7 or more adult units in a locality averaged more dollars' worth of family living from the farm than those of less than 3 adult units.

An extensive list of publications relating to the organization and management of farms and to the family living from the farm in the localities included in this bulletin is given.

Urbanization and rural depopulation in France, J. G. Thompson (*Jour. Farm Econ., 7 (1925), No. 1, pp. 145–151*).—The pronounced cityward trend in France in the period 1876–1881, to which that of the period 1906–1911 was a close second, is pointed out. The rural exodus was most pronounced among agricultural laborers. Between 1911 and 1921 this movement appears to have been comparatively small. The author's observations relative to the economic and social significance of this cityward migration are that agricultural technique, the variety of products, and total production have been materially improved, while the agricultural class has increased its wealth and well-being. The inevitable outcome of such developments in view of the relatively inelastic demand for the products of agriculture would be a further rural exodus, though restriction of the long working hours among French agriculturists would tend, if realized, to counteract the tendency toward such an outcome. Conditions are somewhat more favorable in the rural districts than in the urban centers for a higher birth rate.

Research problems in the psychology of rural life, L. L. BERNARD (*Jour. Social Forces, 3 (1925), No. 3, pp. 446–458*).—The author takes up here the mental or psychic characteristics of people and environments and the classification of problems of psychic and psychosocial adjustment in rural people and rural life, and offers some suggestions with reference to the proper subjects of psychological and psychosociological investigation. Thirty-three problems are listed under the main heads of individual traits, repressions, and releases; psychosocial problems of communication and control; the social environments and rural attitudes; and rural life organization and control. Discussions of this paper are contributed by C. E. Lively, C. C. Taylor, and S. H. Hobbs, jr.

Index numbers of production, wages, and prices, J. I. FALCONER (*Ohio Sta. Bimo. Bul. 10 (1925), No. 7, pp. 102–104*).—A proposed series of tables of index numbers is begun. The first of the two here presented shows the trend of wholesale prices of all commodities, prices of nonagricultural products and farm prices, the wages of New York factory workers, and farm wages for the years 1913–1924 and by months in 1924 and up to April, 1925, and the second the per capita consumption of meats, 1907 to 1924, inclusive.

Agriculture and livestock in Sweden, 1923 [trans. title], L. WIDELL (*[Sweden] K. Statis. Centralbyrån, Sveriges Off. Statis., Jordbr. och Boskapsskötsel, 1923, pp. VII+61*).—This annual report, presenting statistics for Sweden, continues the series previously noted (E. S. R., 51, p. 895.)

AGRICULTURAL EDUCATION

Actual farming: Its processes and practice, W. J. MALDEN (*London: Ernest Benn, Ltd., 1925, vols. 1, pp. 207; 2, pp. 295, figs. 41; 3, pp. 240*).—A nontechnical handbook of general farming consists of three volumes devoted, respectively, to the farm, its nature and treatment; croppings, pastures, and weeds; and livestock, labor, and marketing.

The science of prices, J. A. TODD (*London and New York: Humphrey Milford, Oxford Univ. Press, 1925, pp. XII+264, figs. 2*).—This is a textbook based upon Marshall's statement of economic theory. The author's illustrations have been taken largely from the cotton industry. Chapters are included on land and systems of land tenure.

[Home economics education and extension] (*Jour. Home Econ., 17 (1925), No. 10, pp. 547–551*).—Abstracts are given of the following four papers read before the home economics education and extension sections of the eighteenth annual meeting of the American Home Economics Association: Teaching Ideals through Home Economics, by F. Harrison; The Place of Home Economics in Curriculum Revision, by A. C. Olney; Family and Community Relationships as Essentials in Training for Homemaking, by M. S. Lyle; and The Mental Training of the Pre-school Child, by L. J. Martin.

Problems in home economics teaching, L. F. BOWMAN (*Chicago: Univ. Chicago Press, 1925, pp. VIII+146*).—The outlines of 67 problems designed to supplement the textbooks in methods used in training home economics teachers are presented, with a brief list of references pertaining to each.

Report on home economics training for the year 1923 [trans. title] (*[Norway], Landbr. Dir. Årsberet., Tillegg N, Beret. Husmorundervis., 1923, pp. [3]+VII+39*).—A later report by the Director of Agriculture for Norway succeeds one previously noted (E. S. R., 51, p. 493).

Equipment for teaching home making in Texas high schools, J. W. HARRIS (*Tex. State Bd. Vocat. Ed. Bul. 140 (1922), pp. 71, figs. 40*).—Floor plans and other drawings are given, together with descriptions, in making

suggestions for a group of rooms or for individual rooms as foods, clothing, and home-nursing laboratories. The required equipment for vocational home-making departments in high schools, including that for the teaching of physiology, hygiene, and sanitation, is listed, and a brief bibliography is given.

The efficient kitchen, G. B. CHILD (*New York: Robert M. McBride & Co., 1925, rev. ed., pp. [XXII]+259, pls. 8, figs. 37*).—The arrangement and equipment of the modern kitchen for labor and time saving are set forth in considerable detail, with lists, drawings, and price quotations.

Food buying and our markets, D. MONROE and L. M. STRATTON (*Boston: M. Barrows & Co., 1925, pp. VIII+321, figs. 4*).—This elementary textbook is designed to direct the attention of the housewife to conditions affecting food costs and the methods, services, and agencies involved in getting foods to the consumer.

Extension work in foods and nutrition, 1923, M. BIRDSEYE (*U. S. Dept. Agr., Dept Circ. 349 (1925), pp. 31, figs. 7*).—The principal lines of work carried on were the improvement of food habits through demonstrations in food selection, food preparation and preservation or conservation, the development of the food supply through the family fruit and vegetable garden and in other ways, community nutrition and health education activities, and the promotion of the standardization and marketing of canned and preserved products and other foods furnished by the farm. The need of adopting long-time foods and nutrition programs throughout the country is pointed out. Some of the recommendations of the Western States conference (E. S. R., 50, p. 695) are noted, and a suggested family nutrition standard is outlined.

Women's institutes in Canada, T. F. ASTLE (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 3, pp. 370–376*).—A brief account is presented of the objects of women's institutes; the legislation providing for them; organization, membership, and programs; their activities; and federations.

Boys' and girls' summer and winter garden clubs, A. B. BALLANTYNE and M. F. WHARTON (*Ariz. Agr. Col. Ext. Circ. 52 (1925), pp. 18+[10]*).—The requirements for membership in these clubs are outlined, and suggestions are offered with regard to the preparation and care of the garden and growing certain vegetables. Blanks are given for recording expenses, receipts, and other items.

MISCELLANEOUS

Work of the Newlands Reclamation Project Experiment Farm in 1922 and 1923, F. B. HEADLEY, E. W. KNIGHT, and L. E. CLINE (*U. S. Dept. Agr., Dept. Circ. 352 (1925), pp. 27, figs. 3*).—The agricultural conditions on the project are described, meteorological data summarized, and the experimental work of the two years reported, as abstracted elsewhere in this issue.

Recent results of work of the N. C. Agricultural Experiment Station and the present program of work (*North Carolina Sta. Bul. 247 (1925), pp. 72, figs. 16*).—This includes a description and brief summaries of the recent results of the station work, to which is appended a program of the work under way, classified by subjects and embodying some of the results already obtained. Most of these results have already been noted from other sources, but those not so noted are for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [July–August, 1925] (*Ohio Sta. Bimo. Bul. 10 (1925), No. 7, pp. 97–128, figs. 6*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: A New Department—Rural Economics, by C. G. Williams, and Clover Mites and Chiggers, by A. E. Miller.

NOTES

Rutgers University and New Jersey Stations.—Dr. John Martin Thomas was inaugurated as president October 14. In his inaugural address, Dr. Thomas advocated the expansion of the facilities of the university to meet the needs of the State for higher education, recommending the strengthening of the work in the College of Arts and Sciences, new buildings and equipment for the College of Engineering and an engineering experiment station, the development of the graduate school, and greater support for the school of education. Plans are already under way for engineering extension courses in industrial centers.

The enrollment in the College of Agriculture comprises 85 undergraduates and 24 graduate students. The entering class is larger than in 1924, but the total enrollment remains somewhat less than that of five years ago.

During the fall, winter, and spring a series of unit courses of one and two weeks' duration will be offered. The following subjects will be covered: Poultry feeding, poultry management, dairy bacteriology, forage and pasture crops, marketing, milk testing, dairy and livestock feeding, flower gardening, vegetable gardening, dairy and livestock management, tractor operation, incubation and brooding, ice cream making, market milk, poultry judging and culling, and pruning and spraying.

Fall meetings at the college have included, on October 21, a conference of feed dealers; on December 1, a conference of bankers; and from October 28 to 30, the annual meeting of the agricultural school students and the quarterly conference of the extension agents.

Drs. W. C. Russell and G. T. Nightingale have been appointed biochemists in nutrition and horticulture, respectively. George W. Hervey has resigned as acting head of the poultry department and has been succeeded by Willard H. Allen.

Nebraska University.—Benjamin I. Masurovsky has resigned as instructor in dairy husbandry, effective December 1.

Ohio Station.—William J. Green, for nearly 40 years horticulturist of the station and one of the pioneers in horticultural investigation, died at his home in Sugar Grove on October 12.

Mr. Green was born June 18, 1849, in Medina County, and was educated at Oberlin and Berea colleges, with special studies in botany, chemistry, and horticulture at Ohio State University from 1881 to 1883. As a boy he was much interested in botanical studies and while at the university was given charge of the gardens. After more or less intermittent employment at the station from its beginning in 1882, he was appointed horticulturist in 1883 and served in this capacity until retiring in 1921. For many years of this period he was also vice director.

Mr. Green's practical knowledge and sound judgment proved of great value to the station. Among his many useful contributions were his studies leading to the rejuvenation of orcharding in southeastern Ohio, the inauguration of forestry work by the station, and the beginning of greenhouse investigations.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
10 CENTS PER COPY
SUBSCRIPTION PRICE, 75 CENTS PER YEAR
V

INDEX OF NAMES

Abbot, C. G., 615, 812.
Abbott, E. V., 499.
Abbott, O., 124.
Abbott, W. S., 452.
Abel, J. F., 396.
Ackerson, C. W., 671.
Adametz, L., 269.
Adams, A. B., 840.
Adams, F. O., 580.
Adams, H., 684.
Adams, H. C., 188.
Adams, J., 24.
Adams, J. F., 353, 856.
Adams, W. G. S., 93.
Adams, W. L., 420, 465.
Adie, H. A., 552.
Adinarayana Rao, K., 16.
Adler, S., 386.
Aereboe, F., 591.
Africa, A. A., 207.
Agafonoff, V., 418.
Agg, T. R., 483.
Aggs, W. H., 794.
Agnew, M. A., 298.
Aguiló Cortés, I., 844.
Agullo, I., 157.
Ainsworth-Davis, J. R., 792.
Aiyar, T. V. R., 861.
Ajrekar, S. L., 45.
Åkerman, Å., 235.
Albert, D. W., 733, 740.
Albert, W. B., 432.
Albrecht, A. E., 376.
Albrecht, W. A., 414.
Albright, W. D., 137.
Alcock, A. W., 534.
Alcott, M. D., 365.
Alden, C. H., 454.
Alder, B., 877.
Alderman, O. A., 745.
Aldrich, J. M., 257, 654.
Alex, A. H., 456.
Alexander, W. P., 838.
Ali Kahn, A. Y., 682.
Ali, M. S., 632.
Allan, J., 801.
Allas, T. P., 575.
Alleman, L. J., 896.
Allen, E., 526, 732, 834.
Allen, E. W., 482, 598, 601, 604, 696, 707, 708, 800.
Allen, G. M., 252.
Allen, H. R., 420.
Allen, H. W., 458.
Allen, J. M., 846.
Allen, W. H., 72, 900.
Allison, F. E., 521.
Allison, R. V., 19.
Allred, C. E., 494.
Allyn, O. M., 247.
Alsberg, C. L., 105, 410.
Alten, F., 22, 115.
Amadon, R. S., 600.
Ames, C. T., 56, 131, 136, 195.
Ames, J. W., 898.
Amiable, J. V., 134.
Ammen, W. W., 309.
Amos, E. G., 399.
Anderegg, L. T., 866.
Anders, C. B., 332, 341, 398.
Anderson, A., 433.
Anderson, B. M., 370.
Anderson, B. M., jr., 90.
Anderson, E. G., 229.
Anderson, F., 530.
Anderson, G. F., 667.
Anderson, H. W., 547, 548, 549.
Anderson, P. J., 444, 852, 854.
Anderson, T. J., 156.
Anderson, W. S., 35, 37, 40, 239.
Andersson, I., 330.
Anderton, B. A., 483.
Andea, J. O., 699.
Andres, A., 652.
Andrews, H. J., 399.
Angus, T. C., 764.
Ankney, J. V., 600.
Antevs, E., 614.
Anthony, R. D., 287, 439.
Antram, C. B., 53.
Appel, A., 270.
Appleman, C. O., 635.
Archibald, J. G., 473, 572
Arends, J., 699.
Armi, P. von Dall', 126.
Armstrong, E. F., 801.
Armstrong, G. M., 759.
Arnett, C. N., 771.
Arnold, C. W. B., 17.
Arnold, E. C., 651.
Arny, A. C., 34.
Arrhenius, O., 320.
Arthur, J. M., 355.
Artschwager, E., 324.
Ascherson, 802.
Ash, D. H., 764.
Ashby, A. W., 688, 692.
Ashby, S. F., 152.
Ashley, W. J., 93.
Ashplant, H., 414.
Ashworth, J. T., 450.
Askinazi, D. L., 617.
Astle, T. F., 899.
Aston, F. W., 711.
Asuncion, S., 835.
Atanasoff, D., 43.
Atkeson, M. M., 297.
Atkins, W. R. G., 408.
Atkinson, L. B., 71.
Attinger, 270.
Atwater, W. O., 602.
Atwood, H., 671.
Aune, B., 316, 334, 345, 370, 371, 390, 398.
Aust, F. A., 438.
Austin, W. L., 203.
Averna-Saccá, R. 46.

Baashuus-Jessen, J., 269.
Babcock, C. J., 75, 879.
Bach, 87.
Bach, W. J., 855.
Bachmann, F. M., 348.
Back, E. A., 453.
Badollet, M. S., 613.
Baer, W., 652.
Baerg, W. J., 157, 256.
Bagg, H. J., 833.
Bahnsen, P. F., 80.
Bahrt, G. M., 511.
Bailey, A. A., 747, 849.
Bailey, C. F., 667, 668, 869, 871, 878.
Bailey, C. H., 409, 410.
Bailey, D. L., 847.
Bailey, E. M., 657, 666.
Bailey, I. W., 559.
Bailey, L. H., 40, 314, 807.
Bailey, S. F., 582.
Baird, P. K., 209.
Baird, T., 399.
Baird, W. P., 132, 140, 528, 535.
Baird, W. W., 674, 871.
Baker, D. D., 280.
Baker, F. S., 541.
Baker, J. R., 631.
Baker, L. M., 535.
Baker, O. E., 100.
Baker, S. L., 612.
Baker, W. G., 620.
Bakker, D. L., 269.

Bal, D. V., 618.
Balch, R. T., 811.
Balderston, R. W., 289.
Baldt, L. I., 398.
Baldwin, F. M., 381, 767.
Ball, E. D., 196, 598.
Ball, N. G., 228.
Ballantyne, A. B., 809.
Ballantyne, S., 879.
Ballard, W. W., 336.
Ballings, M., 49.
Ballou, F. H., 39, 548.
Balls, W. L., 737.
Balmaceda, J. C., 894.
Balozet, L., 786.
Baly, E. C. C., 125.
Bancroft, P. M., 273.
Bang, B., 270.
Banks, H. L., 365.
Banting, F. G., 462.
Barber, C. A., 249.
Barber, G. W., 256, 653, 757.
Bardwell, H. E., 187.
Barger, E. H., 381.
Barger, W. R., 354.
Barker, A. F., 170.
Barker, W. F., 125.
Barkley, M., 399.
Barnard, L. C., 614.
Barnes, M. E., 859.
Barnette, R M., 196, 622, 699.
Barotte, J., 786, 884.
Barr, G., 531.
Barratt, T., 531.
Barre, H. W., 500.
Barrera, J. R., 643.
Barreto, B. T., 57.
Barringer, B. E., 397.
Barrios, F. A. S., 474.
Barritt, N. W., 633.
Barron, L., 139.
Barrow, D. N., 249, 499.
Barrow, E. H., 860.
Barry, M. W., 95.
Barss, H. P., 148, 151.
Barthel, C., 121, 424, 581.
Bartholomew, R. P., 415.
Bartholow, F. A., 590.
Bartlett, J. M., 539.
Bartlett, J. W., 175.
Barton, H., 200.
Barua, K. L., 31.
Barulina, E. I., 138.
Basappa, M., 858.
Batchelor, H. W., 512.
Bates, C. G., 41.
Bates, E. N., 895.
Batt, H. E., 279.
Batten, H. M., 50.
Baude, P., 10, 406.
Bauer, F. C., 720.
Baughman, W. F., 9.
Baumgartel, W. H., 893.
Baur, F., 718.
Baxter, R. W., 797.
Baylis, H. A., 760.
Baylor, A.S., 598.
Baynham, M., 496.
Beach, B. A., 179, 383, 478, 479.
Beach, J. R., 183.
Beal, W. H., 597,696.
Beals, C. M., 124.
Bean, L. H., 92, 289.
Bean, W. J., 243.
Bear, F. E., 698.
Beattie, W. R., 695.
Beaudette, F. R., 482, 786.
Beaufreton, M., 591.
Beaumont, A. B., 818.
Beaumont, J. H., 143.
Beauverie, J., 543.
Becker, J., 842.
Becker, J. E., 660, 766, 767.
Beckerich, A., 246, 250.
Beckett, S. H., 399.
Beckwith, C. S., 256.
Becquerel, P., 521.
Bedford, G. A. H., 657.
Bedford, T., 764.
Bedson, S. P., 81.
Behre, C. E., 243.
Beier, F. W., jr., 395.
Belgrave, W. N. C., 845.
Bell, D. S., 468.
Bell, J. C., 810.
Bell, R. W., 881.
Belling, J., 227, 328.
Belloc, H., 186.
Belton, H. L., 590.
Beltran, J. R., 562.
Belval, H., 519, 725.
Belyea, H. C., 41, 441.
Bemmelen, J. M. van, 802.
Bendixon, H. A., 676.
Benecke, W., 623.
Benedict, F. G., 364, 571, 862.
Bengtson, I. A., 662.
Bengtsson, S., 668.
Benjamin, E. W., 397.
Benner, C. L., 498, 692, 895.
Bennett, C. W., 37.
Bennett, R. V., 97.
Benson, H. K., 811.
Bentley, M. R., 86.
Benton, A. H., 292, 600.
Benton, J. R., 598.
Benton, T. H., 416.
Bercaw, L. O., 294.
Bercsi, J., 684.
Berger, A., 424.
Berger, E. W., 856.
Bergford, R. E., 284.
Berlese, A.,156.
Bernard, L. L., 898.
Bernard, P. M., 66.
Berndt, W., 832.
Besnès, J., 52.
Berry, A. E., 276.
Berry, G. A., 776.
Berry, L. N., 98.
Bertrand, G., 364.
Besson, L., 719.
Best, C. H., 804.
Bethke, R. M., 71, 273, 876.
Bevan, E. W., 886.
Bewley, W. F., 550.
Beyer, A. H., 196.
Bezssonoff, N., 20, 117, 608, 826.
Bialosuknia, W., 123.
Bickel, A., 766.
Bidwell, G. L., 805.
Bierman, H. R., 110.
Bigelow, W. D., 208.
Bigot, A., 418.
Bilsing, S. W., 361.
Binet, L., 367.
Bioletti, F. T., 744.
Birch, R. R., 78, 678.
Birdseye, M., 899.
Bissell, G. W., 598.
Bizzell, W. B., 500, 706.
Black, J. D., 289, 294, 489, 709, 896.
Black, L. M., 98.
Black, R. H., 399.
Blackman, L. E., 498.
Blackman, V. H., 222.
Blackshaw, J. F., 176.
Blair, A. W., 16, 219, 416, 619.
Blair, R. E., 691.
Blair, W. S., 218, 340.
Blaisdell, F. E., 587.
Blake, E. G., 684.
Blake, M. A., 345.
Blakeslee, A. F., 226, 227, 328, 329.
Blanck, E., 22, 115, 516.
Blaney, H. F., 587.
Blank, L., 193.
Blaringhem, L., 128, 129, 625, 729, 730, 731, 837.
Blasingame, R. U., 486.
Bledisloe (Lord), 200.
Blish, M. J., 409, 671.
Blizzard, W. L., 272.
Blodgett, F. M., 853.
Bloor, W. R., 763.
Blosset, 615.
Blum, L., 520.
Blunt, K., 704.
Boardman, H. S., 598, 800.
Boas, J. E. V., 651.
Boas, M. A., 162.
Boatman, B., 616.
Bober, S. H., 371.
Bobko, E. V., 617.
Bodansky, A., 824.
Bode, F. W. M., 857.
Bode, H. R., 624.
Bodenheimer, F. S., 157, 654.
Bodroux, F., 505.
Boerner, E. G., 614.
Boerner, F., 77.
Boeuf, F., 134.
Bogert, L. J., 801.
Boggs, N., 154.
Bogod, M., 505.

Bohart, G. S., 208.
Bohstedt, G., 96, 468, 571.
Bolin, P., 835.
Bolla, G. G., 596.
Bollen, W. B., 622.
Bolliger, A., 763.
Bolling, G. E., 581.
Bonnamour, S., 656.
Bonnen, C. A., 489.
Bonnet, L. O., 537.
Bonnet, R., 827.
Bonnevie, K., 522.
Boquet, A., 886.
Borthwick, H. A., 22.
Bos, H., 813.
Boss, A., 598.
Boswell, V. R., 240.
Bosworth, T. J., 887.
Botjes, J. O., 852.
Bouchet, J., 90.
Bouges, L. C., 877.
Boughton, I. B., 78, 786.
Bouyoucos, G., 319.
Bouyoucos, G. J., 816, 817.
Bowen, J. T., 791.
Bower, J., jr., 113, 413.
Bowes, O. C., 178.
Bowman, C. F., 85.
Bowman, H. E., 580.
Bowman, H. H. M., 503.
Bowman, J. J., 855.
Bowman, L. F., 898.
Bowstead, J. E., 67, 68.
Box, H. E., 155.
Boyd, G. L., 663.
Boyd, G. R., 399.
Boyd, J. D., 569.
Boyd, J. E., 483.
Boyd, J. R., 284.
Boyd, W. L., 178, 385.
Boyle, J. E., 594.
Braak, C., 812.
Bradbury, F., 530.
Braden, A. P. M., 230.
Bradfield, R., 816.
Bradford, F. C., 39, 536.
Bradfute, O. E., 704.
Bradley, J. C., 252.
Bradley, W. G., 554.
Braham, J. M., 322, 713.
Brambell, F. W. R., 30.
Branaman, G. A., 773.
Branch, H. N., 596.
Brand, C. J., 492.
Brandes, E. W., 22, 249.
Brannen, C. O., 90, 289.
Brannon, J. M., 123, 883.
Bransfield, P. E., 889.
Branson, E. C., 699.
Braun, 504.
Braun, H., 865.
Bray, M. W., 856.
Breckenridge, J. E., 109, 715.
Bredemann, G., 235.
Breed, R. S., 412.
Bremer, G., 353.
Brentzel, W. E., 600, 851.
Brewbaker, H. E., 226.
Brewer, S. L., 607.
Bridel, M., 826.
Bridges, A., 688.
Bridges, C. B., 380, 524.
Brierly, W. B., 43, 245.
Briggs, F. N., 148, 542.
Briggs, G., 435.
Briggs, G. M., 435.
Briggs, I. A., 234.
Brinckloe, W. D., 400.
Brinkmann, T., 270.
Brinsmade, J. C., jr., 132.
Brinsmaid, W., 805.
Brisley, H. R., 158.
Brittain, W. H., 53, 358.
Brittlebank, C. C., 151.
Britton, W. E., 450, 697.
Broadbent, B. M., 361.
Broadfoot, R., 835.
Broadhurst, J., 363.
Brody, S., 479.
Bronfenbrenner, J. J., 279, 367, 368.
Brooke, R. O., 500.
Brooks, C. F., 210, 316, 508.
Brooks, F. T., 43, 657.
Brown, B. A., 737, 751, 837.
Brown, G. A., 773.
Brown, H. M., 798.
Brown, J. G., 745.
Brown, J. J., 121.
Brown, J. S., 281.
Brown, N. A., 865.
Brown, P. E., 420, 510.
Brown, R. J., 811.
Brown, T., 685.
Brown, W. R., 145.
Browne, C. A., 712.
Browne, E. L., 683.
Brožek, A., 628.
Bruce, O. C., 417, 735.
Brun, R., 861.
Bruner, S. C., 47.
Bruner, S. E., 78.
Brunett, E. L., 183, 889.
Brunkow, O. R., 716.
Brunner, E. de S., 394.
Brunnich, J. C., 571.
Brünnich, K., 652.
Brutsaert, P., 224.
Bruynoghe, R., 224.
Bryan, E. N., 285.
Bryan, K., 890.
Bryan, P. W., 397.
Bryan, W. E., 734.
Bryant, J. P., 261.
Brydon, M. E., 95.
Buchanan, D. S., 198.
Buchanan, F. A., 380.
Buchanan, R. E., 707.
Buchanan, W. D., 288.
Buchheim, A., 43.
Buchholz, J. T., 41.
Buchholz, Y., 636.
Buck, J. L., 597.
Buckell, E. R., 756.
Buckley, J. S., 382.
Buckner, G. D., 376, 577, 878.
Buddin, W., 550.
Buder, C. G., 590.
Bull, C. G., 784.
Bundesen, H. N., 178, 267.
Bunyard, E. A., 843.
Buquet, R., 67.
Burch, D. S., 95.
Burd, L. H., 336, 337.
Burger, H., 113.
Burger, O. F., 650.
Burgess, J. L., 238.
Burgos, C. X., 72.
Burke, E., 417.
Burke, G. W., 86.
Burkholder, W. H., 543.
Burlison, W. L., 349, 799.
Burnet, E., 582.
Burnett, E. A., 498, 598, 706.
Burnett, W. L., 153, 154.
Burns, A. C., 513.
Burns, W., 638.
Burr, G. O., 661.
Burr, H. R., 399.
Burr, W. W., 318.
Burroughs, A. M., 437.
Burrows, G. H., 105.
Burt, E. A., 153.
Burton, G. J. L., 632.
Burton, J. Q., 611.
Bushnell, J., 96, 635.
Buswell, K. P., 558.
Butler, E. J., 813.
Butler, M., 94.
Butler, O., 348, 431, 444, 445, 446, 447.
Butler, W. J., 179.
Byers, J. R. B., 590.
Bynum, E. K., 361.

Caffrey, D. J., 361.
Cajori, F. A., 822.
Calderwood, H. N., jr., 718.
Caldwell, M. L., 106.
Calhoun, P. W., 196.
Call, L. E., 498, 534.
Callenbach, E. W., 99.
Calvert, E. B., 112, 210, 718.
Calvino, E. M., 236.
Calvino, E. M. de, 739, 838.
Calvino, M., 236, 523.
Cameron, A. E., 553.
Camp, A. F., 196.
Camp, W. R., 190.
Campanile, G., 47.
Campbell, J. A., 764.
Campbell, (Mrs.) J. C., 94.
Campbell, M. H., 128.
Campbell, R. E., 360.
Campbell, R.H., 145.
Campin, M. G., 328.
Cance, A. E., 690, 894.
Canfield, H., 767.
Canney, E. E., 14.
Cannon, H. G., 323.

Cannon, W. A., 421, 823.
Capper, A., 289.
Capper, A. H., 174.
Capus, J., 325.
Caraud, P., 94.
Card, F. W., 536.
Cardinell, H. A., 37, 39.
Cardon, P. V., 699.
Caridroit, 130.
Carlson, J. W., 699.
Carlson, K. A., 744.
Carlsson, V., 566, 764.
Carlyle, E. C., 500.
Carmichael, B. E., 574.
Carncross, J., 98.
Caro, R. J., 804.
Carpenter, C. M., 785, 885.
Carpenter, F. B., 804.
Carpenter, G. H., 357.
Carr, M., 262. 563.
Carr, R. H., 375, 637.
Carrick, C. W., 671, 768.
Carrick, D. B., 727.
Carson, W. E., 212.
Carter, D. G., 387, 587.
Carter, E. G., 699.
Carter, L. M., 212.
Carvalhoz, B., 693.
Carver, J. S., 288.
Carver, W. A., 196.
Cary, C. A., 78, 571.
Caryl, R. E., 643.
Case, H. C. M., 88.
Caslick, E. A., 399.
Castella, F. de, 151.
Castetter, E. F., 328.
Castle, W. E., 298, 522, 630.
Cathcart, C. S., 22, 37, 220, 666.
Cathcart, E. P., 762.
Catlin, C. N., 418, 769, 789, 799.
Catoire, M., 725.
Cavanaugh, G. W., 165.
Cave, H. W., 377.
Caverhill, P. Z., 644.
Chabanne, G., 845.
Chalmers, H., 595.
Chamberlain, C. J., 420.
Chambers, C. R., 189.
Chambers, T. B., 487.
Champlain, A. B., 360.
Chandler, W. H., 641.
Chang, T. C., 736.
Channon, H. J., 377, 880.
Chapin, E. A., 553.
Chapman, A., 251.
Chapman, H. H., 244.
Chapman, J. M., 691.
Chapman, P. W., 397.
Chardón, C. E., 249, 649.
Charlan, F., 340.
Charlton, J., 510.
Charlton, P. H., 525, 526.
Charriou, A., 420.
Chase, O. E., 457.
Chase, W. D., 322.
Chattock, A. P., 672.
Chavastelon, R., 589.
Cheesman, E. L., 160.
Cheney, R. H., 644.
Chesnut, V. K., 159.
Chick, H., 264.
Chifflot, J., 845.
Child, G. B., 899.
Chilson, C. H., 580.
Chisholm, G. G., 95.
Chittenden, A. K., 345, 346.
Chittenden, D. W., 470, 471.
Chittenden, F. H., 159.
Chouchack, D., 321.
Choulet, A., 845.
Christ, J. H., 509, 511, 514, 528, 599.
Christensen, F. W., 571.
Christensen, H. R., 510, 514.
Christensen, J. J., 749.
Christie, A. W., 614.
Christie, G. I., 97, 104, 800.
Christophers, S. R., 552, 859.
Chu, A. V., 857.
Chu, C., 210.
Chupp, C., 246.
Churchill, C. H., jr., 686.
Ciamician, G., 826.
Ciurea, T., 257.
Clague, J., 31.
Clark, E. P., 505, 564.
Clark, F. E., 694.
Clark, H. W., 792.
Clark, J., 56, 57, 860.
Clark, J. E., 814.
Clark, R. S., 176.
Clark, S. P., 234, 419, 733.
Clarke, C. K., 427.
Clarke, F. W., 212.
Clarke, S. E., 729.
Clarou, C., 287.
Clayden, A. L., 685.
Clayton, H. H., 508, 812.
Clayton, W., 711, 801.
Cleghorne, W. S. H., 790.
Clemencet, N. B., 504.
Clement, C. E., 580.
Clements, E. S., 825.
Clements, F. E., 728, 823, 824, 825, 826.
Clements, J. B., 117.
Clickner, F. H., 98, 472.
Clifford, W. M., 761.
Cline, L. E., 812, 834, 840, 870, 889, 893, 899.
Clinton, G. P., 441.
Close, C. P., 695.
Clutter, J. A., 677.
Cluver, E. H., 884.
Clyde, G. D., 483.
Coats, R. H., 178.
Cochet-Cochet, 845.
Cockayne, A. H., 69.
Cockerell, T. D. A., 331.
Code, W. E., 789.
Coe, W. R., 27.
Coert, J. H., 47, 353.
Coffey, W. C., 498.
Coffin, E. W., 891.
Coffman, F. A., 223, 338, 830.
Coffman, J. H., 178.
Cohen, H., 207.
Cohn, E. J., 711.
Cole, F. R., 359.
Cole, L. J., 428, 571.
Cole, W. C., 699.
Colebatch, W. J., 120.
Coleman, D. A., 611.
Coleman, L. C., 152.
Colgate, C. E., 526.
Colin, H., 519, 725.
Collazo, J. A., 566.
Collens, A. E., 837.
Colley, R. H., 347, 651.
Collingwood, G. H., 695.
Collins, G. E., 33, 312.
Collins, J. F., 650.
Collins, J. H., 716.
Collins, W. O., 212.
Collip, J. B., 505, 563, 564.
Colson, H. C., 59.
Colthurst, I., 243.
Comber, H. F., 41.
Combes, R., 125, 325.
Combs, W. B., 178.
Compere, H., 260.
Compton, C. C., 362, 555.
Comstock, J. H., 252.
Conklin, R. E., 366.
Conklin, R. L., 381.
Connaway, J. W., 78, 480.
Connell, I., 296.
Conner, A. B., 27.
Conner, C. N., 83.
Conner, S. D., 326.
Connor, C. L., 760.
Conover, M., 587.
Conrey, G. W., 698.
Cook, H. A., 507.
Cook, K. M., 495.
Cook, L. J., 723.
Cook, M. T., 47, 147, 153, 224, 248, 250.
Cook, W. C., 557.
Cook, W. S., 324.
Cooke, M. L., 485.
Cooley, C. L., 832.
Cooley, R. A., 51.
Cooley, R. B., 571.
Coolidge, C., 597.
Coons, G. H., 248, 647, 751, 849, 853.
Cooper, M. R., 489.
Cooper, T. P., 498, 598, 709.
Cooper, W. S., 823.
Copaux, H., 813.
Copleston, W. E., 645.
Corbett, G. H., 259.
Corbett, R. B., 499.
Corkins, C. L., 154.
Cormany, C. E., 339, 398.
Cornell, B. S., 678.
Corper, H. J., 884.
Cortés, I. A., 844.

Corwin, G. E., 80, 384.
Cory, E. N., 360, 856.
Cosmovici, N. L., 312.
Cotner, J. B., 736.
Cotter, J. L., 40.
Cotton, R. T., 453, 558.
Cotton, W. E., 480.
Coulter, J. L., 289, 706.
Coupin, H., 521, 727.
Covell, G. A., 598.
Coville, F. V., 122.
Coward, K. H., 377, 765.
Cowart, R., 234.
Cowdry, E. V., 783.
Cowell, S. J., 661.
Cowles, H. C., 694.
Craft, W. A., 360.
Craighead, F. C., 559, 655.
Cram, E. B., 385, 553, 584, 760, 787.
Cramer, W., 459, 461.
Crandall, C. S., 39.
Crandall, F. K., 723, 724.
Crane, C. B., 694.
Crawford, A. B., 382.
Crawford, C. W., 71.
Crawford, E. M., 699.
Crawford, H. G., 361.
Crawford, J. C., 557.
Crawford, R. F., 847.
Crémieu, V., 518.
Crew, F. A. E., 731.
Crichton, J. A., 172.
Crickman, C. W., 687.
Crider, F. J., 733, 740.
Crisai, F., 121.
Crisanto, J., 542.
Crist, J. W., 17, 825.
Crocker, W., 799.
Cron, A. B., 500.
Cronemiller, L. F., 113.
Crosby, C. R., 697.
Crosby, D. J., 95.
Crosby, H. T., 692.
Crosby, P. A., 286.
Cross, C. F., 801.
Cross, W. E., 137, 249.
Crossley, A. W., 530.
Crossman, S. S., 561.
Crouch, C. H., 598.
Crown, R., 196.
Crowther, E. M., 621.
Crozier, W. J., 288.
Crüger, 246.
Crum, R. W., 790.
Cuff, R. L., 179.
Culbertson, C. C., 570, 777.
Cumings, G. A., 185.
Cunningham, J. T., 525.
Cunningham, M., 767.
Curran, C. E., 209.
Curran, H. R., 676.
Currence, T. M., 800.
Currie, A. N., 206.
Currier, E. L., 499.
Currin, R. E., jr., 775.
Curson, H. H., 159.
Curtice, C., 585.
Curtis, C. C., 243.
Curtis, H. A., 122.
Curtis, H. E., 420.
Curtis, R. S., 770, 867.
Curtiss, C. F., 498, 571, 798.
Cushing, E. R., 680.
Cutright, C. R., 56.
Czerny, L., 560.

Dack, G. M., 609, 784.
Dadisman, A. J., 488.
Dafert, O., 120, 121.
Dahlberg, A. C., 475.
Dahlberg, A. O., 314.
Dahmen, H., 181.
Dall' Armi, P. von, 126.
Dalrymple, G. B., 22.
Dalrymple, W. H., 196.
Daly, P. M., 143.
Damme, C. van, 270.
Damon, S. C., 724.
Dangeard, P., 422, 520, 725.
Dangeard, P. A., 422.
Danheim, B. L., 885.
Daniel, L., 519, 627, 726.
Daniels, A. L., 564, 568.
Daniels, H. O., 580.
Darlow, A. E., 68, 427, 467.
Darrow, G. M., 536.
Darshan Singh, S., 63.
Dastur, J. F., 247.
Dauvergne, J., 827.
Davenport, C. B., 627, 829.
Davenport, E., 598.
David, P. A., 331.
David, W. T., 84, 85.
Davidson, F. A., 176, 675.
Davidson, G., 592.
Davidson, J., 124.
Davidson, J. B., 407.
Davidson, W. D., 837.
Davies, W. M., 286.
Davin, A. G., 522.
Davis, B. F., 78.
Davis, E. M., 499.
Davis, G. L., 451.
Davis, I. G., 576, 797.
Davis, J. R. A. —, 792.
Davis, J. S., 593, 594, 796.
Davis, L. D., 98.
Davis, L. E., 58, 409.
Davis, R. L., 851.
Davis, R. O. E., 816.
Davis, W. H., 640.
Day, E. L., 91.
Day, G. E., 69.
Day, L. E., 78.
Dayanand Mamgain, B., 244.
Dean, G. A., 256.
Dean, H. K., 316, 334, 371, 387, 390, 398.
Dearborn, N., 756.
Dearstyne, R. S., 681, 786.
de Calvino, E. M., 739, 838.
de Castella, F., 151.
Dechambre, 605.
Deffenbaugh, W. S., 95.
de Gryse, J. J., 857.
Deighton, T., 116.
de Jong, W., 270.
de Lagoanere, J. L., 582.
de La Rue, A., 855.
Delassus, 157.
de la Torre, P., 137.
Delf, E. M., 567.
del Guercio, G., 156, 757.
DeLong, D. M., 359.
Delwiche, E. J., 435.
Dengler, A., 539.
Denis, W., 457.
Denney, R., 507.
de Noter, R., 640, 641.
Densch, A., 517.
de Ong, E. R., 52.
DePew, H. F., 881, 883.
Dervaux, G., 641.
Deshusses, J., 314.
Deshusses, L., 314.
Detlefsen, J. A., 523.
Detmers, F., 740.
DeTurk, E. E., 720.
DeVault, G. G., 99.
DeVine, J. F., 78.
Dewar, J. M., 855.
de Wesselow, O. I. V., 411.
d'Herelle, F., 581.
d'Hubert, A., 167.
Dias, E., 357.
Dickens, F., 612.
Dickerson, D. F., 95.
Dickerson, J. K., 110.
Dickert, H. A., 775.
Dickey, J. A., 692.
Dickey, J. B. R., 232.
Dickinson, H. C., 684.
Dicks, A. R., 145.
Dickson, B. T., 646.
Dickson, J. G., 443, 748, 850.
Dieben, C. P. A., 280.
Dietze, C. von, 291.
Digges, D. D., 340, 892.
Dikmans, R. N., 384.
Dill, D. B., 105, 803.
Dillman, A. C., 34.
Dingler, M., 652.
Dinulescu, G., 257.
Dixey, F., 117, 316.
Dixon, H. H., 223.
Dixon, J., 251.
Doan, F. J., 110.
Dobroscky, I. D., 552.
Dodds, E. C., 612.
Dodge, B. O., 550, 854.
Dodson, W. R., 599, 860.
Dobrenko, A. G., 508.
Doisy, E. A., 526, 834.
Domingo, P., 381.
Dominguez, F. L., 121, 133.
Domm, L. V., 832.
Domogalla, B. P., 106.
Donaldson, H. H., 274.
Donatien, A., 182.
Donisthorpe, H., 160.

Doran, W. L., 444, 446.
Dore, W. H., 105.
Dorno, C., 718.
Dorsey, M. J., 125.
Dosdall, L., 749.
Doten, S. B., 497.
Dotterer, W. D., 590.
Doty, R. E., 644.
Doucette, C. F., 362.
Douglas, C. E., 636.
Douglas, S. R., 679.
Douglass, A. E., 825.
Douglass, H. P., 797.
Dow, O. D., 565, 659.
Dowell, C. T., 89, 195.
Dowler, J. F., 698.
Down, E. E., 798.
Dowrie, G. W., 795.
Dowson, W. J., 49, 153.
Doyle, L. P., 786.
Dozier, H. L., 498, 653.
Drake, E. F., 280.
Drechsler, C., 351, 848, 851, 854.
Dressel, K., 392.
Drew, J. P., 596.
Dreyfuss, H., 13.
Driggers, B. F., 143.
Drozdov, N. A., 138.
Drummond, J. C., 377, 660, 661, 711, 863, 880.
Dubin, H. E., 765.
Dubois, G. C., 276.
Dubois, R., 542.
Ducomet, V., 44.
Duerden, J. E., 370.
Duerst, U., 270.
Duffee, F. W., 486.
Dufrénoy, J., 43, 148.
Duggar, B. M., 699.
Dulac, 20.
Duley, F. L., 414, 431.
Dummeier, E. F., 198.
Dunbar, B. A., 780.
Dunbar, C. O., 27.
Duncan, J. F., 392.
Dungan, G. H., 349, 434, 444.
Dunham, B. S., 367.
Dunham, R. S., 130, 136.
Dunn, E. R., 462.
Dunn, L. C., 331, 427.
Dunn, M. S., 156.
Dunnewald, T. J., 199.
Dunning, C. A., 91.
du Plessis, A. M., 844.
Dupont, C., 21.
Dupont, G., 200.
Duran, V., 856.
Durant, A. J., 480.
Durham, G. B., 427.
Dürken, B., 225.
Durrant, J. H., 256.
Durrell, L. W., 135, 423, 544, 749.
Durus, W. P., 486.
Dustan, A. G., 756.
Dustman, R. B., 600.
Dutcher, R. A., 108, 165.
Dutkiewiczowna, B., 332.
Dutton, W. C., 37, 240, 354, 448.
Dvorachek, H. E., 465.
Dvořák, L. F., 94.
Dye, H. W., 856.
Dye, M., 60.
Dyer, S. W., 883.
Dyke, W., 819, 842.
Dykes, W. R., 641.
Dymond, G. C., 838.

Eakins, H. S., 783.
Earle, S. B., 598.
East (Mrs.) B. R., 580.
East, E. M., 220.
Eaton, T. H., 397.
Ebert, G. R. von, 860, 861.
Ebling, W. H., 497.
Eckerson, S. H., 748, 848, 851.
Eckles, C. H., 76, 176.
Eckstein, K., 652.
Eddy, W. H., 204, 566, 764.
Edelmann, R., 278.
Eden, T., 503.
Edgerton, C. W., 850.
Edgington, B. H., 798.
Edinger, A. T., 464.
Edmonds, J. L., 71.
Edson, E. O., 86.
Edwards, A. L., 598.
Edwards, C. W., 468, 496.
Edwards, P., 399.
Effront, J., 223.
Egashira, T., 630.
Eggers, F. C., 95.
Ehler, O., 608.
Eichhorn, A., 278.
Eidmann, H., 652.
Eijkman, C., 764.
Eisinger, J. O., 685.
Elazari, M., 34.
Eldridge, E. F., 86.
Ellenwood, C. W., 89, 743.
Ellett, W. B., 578.
Ellinger, T. U., 571.
Ellington, G. W., 454, 758.
Ellington, K. J., 390.
Elliott, F. A., 145.
Elliott, G. R. B., 18, 589.
Elliott, J. A., 854.
Ellis, E. T., 51.
Ellis, W. O., 559.
Ellsworth, J. O., 690.
Elmer, O. H., 747.
Elmer, R., 311.
Eltringham, H., 558.
Elvehjem, C. A., 379, 464.
Elvehjem, O. M., 483.
Ely, R. T., 100, 400, 490, 598.
Emerson, R. A., 330.
Emerson, W. R. P., 563.
Emery, F. W., 884.
Emmerick, L. P., 880.
Emmons, W. J., 483.
Engel, H., 203.
Epperson, A. W., 714.
Erdman, H. E., 289.
Erdman, L. W., 516.
Eredia, F., 615.
Eriksen, E., 669.
Eriksen, S., 669, 670, 671, 680, 681, 682, 786.
Erikson, S., 399.
Erlanson, C. O., 745.
Ervin, G., 599.
Escherisch, K., 700.
Esplin, A., 699.
Essig, E. O., 156, 158, 159, 856.
Estes, H. R., 580.
Estey, J. A., 691.
Estioko, R. P., 316.
Esty, J. R., 208, 209.
Etheridge, W. C., 431.
Evans, A. C., 886.
Evans, F. R., 314.
Evans, H. M., 661.
Evans, M. P., 245.
Evvard, J. M., 570, 571, 776, 777.
Ewing, D. D., 85.
Ewing, H. E., 53, 656.
Eyer, J. R., 454.
Eynon, L., 505.
Eyre, J. V., 530.
Eyster, W. H., 27, 29, 128, 426.
Ezekiel, W. N., 448.

Fabian, F. W., 798.
Fabre, J. H., 56.
Fagan, F. N., 48.
Fagan, T. W., 338.
Fairbanks, B. W., 397.
Fairchild, L. H., 175.
Falconer, J. I., 291, 698, 873, 895, 898.
Fantham, H. B., 425, 618.
Farley, A. J., 847.
Farnell, R. G. W., 207, 612.
Farnham, M. E., 227.
Farrell, F. D., 597, 598, 800.
Farrington, H. A., 441.
Fatout, P. L., 99.
Faucette, A. M., 797.
Faulkner, H. U., 398.
Faure, J. C., 57, 259, 560.
Favilla, A. D., 395.
Fay, C. R., 594.
Feldman, H. W., 129.
Fell, H. B., 329.
Fellenberg, T. von, 201, 202.
Fellers, C. R., 807.
Fellows, H. C., 611.
Felt, E. P., 252, 357, 860.
Fenelon, K. G., 589.
Feng, C. T., 460.
Fenton, F. C., 399.
Ferencsy, A., 160.

Ferguson, C. M., 376.
Ferguson, N., 329.
Ferguson, O. J., 598.
Fergusson, C. S. R., 655.
Fermi, C., 79.
Ferneyhough, J. G., 78.
Fernow, K. H., 648.
Ferrari, E., 591.
Ferrière, C., 57.
Ferrin, E. F., 571, 575.
Ferris, C. E., 598.
Ferris, E. B., 33, 211, 231, 299.
Ferriss, E. N., 194.
Ferry, E. S., 386.
Ferton, C., 56.
Fetter, F. W., 595.
Fey, K. Y., 857.
Feytaud, J., 159.
Fichtenholz, (Mrs.) S., 827.
Fick, R., 522.
Filley, H. C., 593.
Fincher, M. G., 680.
Findlay, G. M., 307, 460.
Fine, M. S., 9.
Finlow, R. S., 632.
Fischer, L., 767.
Fish, P. A., 268.
Fisher, C. K., 159.
Fisher, D. F., 151.
Fisher, E. A., 614.
Fisher, O. S., 605.
Fisher, R. A., 14, 16.
Fisher, R. C., 109, 315, 808, 809, 883.
Fisher, W. S., 834.
Fiske, G. B., 690.
Fiske, J. G., 238.
Fitch, C. P., 78, 178, 180, 384, 571.
Fitch, J. B., 377.
Fite, A. B., 242.
Fitzpatrick, H. H., 645.
Flanders, S. E., 861.
Fleetwood, J. R., 819.
Fleming, C. E., 467, 478.
Fleming, G. B., 263.
Fleming, W. E., 258, 321, 453.
Fletcher, T. B., 651.
Fletcher, W., 678.
Flinn, F. B., 658.
Flint, E. R., 696, 798.
Flint, W. P., 362, 454.
Flohr, L. B., 294.
Florell, V. H., 832.
Florence, L., 889.
Florin, E. H., 641.
Florin, R., 643.
Flower, E. P., 179.
Fogle, F. E., 792.
Folin, O., 711.
Folsom, D., 544, 648.
Folsom, J. C., 291.
Forbes, E. B., 274, 369, 571.
Forbes, W. T. M., 252, 256.
Ford, C. F., 891.
Fordham, M., 693.
Forsling, C. L., 168, 268.
Forster, G. W., 792.
Forster, R. B., 315.
Fortier, P., 674, 869, 874.
Foster, W. A., 390, 400.
Fournier, M., 505.
Fox, C. S., 587.
Fox, G. A., 795.
Fox, H., 179.
Fox, H. D., 466.
Fracker, S. B., 259.
Frame, B. H., 494.
Francis, B. F., 526, 732.
Francis, E., 651.
Frank, L. C., 580.
Frankenfield, H. C., 83, 788.
Franklin, H. J., 555.
Fraps, G. S., 66, 617.
Fraser, J. R., 679.
Fraser, M., 494.
Frater, G., 205.
Frazier, W. C., 475.
Fred, E. B., 65, 106, 386, 424, 710.
Fredell, G. H., 198.
Frederick, H. J., 699.
Freeland, E. C., 790.
Freeman, E. M., 597.
Freeman, H. A., 340.
French, C., jr., 358.
Frey, C. N., 548.
Frickhinger, H. W., 652.
Fridericia, L. S., 62.
Friederichs, K., 759.
Friedmann, L., 315.
Friend, G. E., 563.
Friend, R. B., 450.
Fries, J. A., 271.
Frison, T. H., 454.
Frizzell, E. J., 98.
Frohawk, F. W., 255.
Fromageot, C., 828.
Fronda, F. M., 183, 374.
Frosch, P., 181.
Frost, J. N., 182.
Frost, P. A., 99.
Frost, S. W., 55, 357, 558.
Frost, W. D., 881.
Fruwirth, C., 628.
Fry, C. L., 394, 395.
Fry, J. M., 99.
Fudge, B. R., 98.
Fullaway, D. T., 253, 652, 653.
Fuller, A. H., 598.
Fuller, F. D., 667.
Fuller, G. L., 212.
Fuller, J. M., 881.
Fulmer, E. I., 105, 660.
Fulton, B. B., 254.
Fulton, H. R., 549.
Funk, C., 566, 765.
Funke, G.-L., 623.
Fyffe, R., 846.
Fyleman, E., 714.
Gabbard, L. P., 893.
Gabriel, H. S., 294.
Gahan, A. B., 561.
Gaiger, S. H., 279, 677.
Gail, W. W., 493.
Gaines, R. C., 759.
Gaines, W. L., 533.
Gallagher, H. J., 398.
Galloway, B. T., 441.
Galpin, C. J., 598.
Gamble, J. A., 600.
Gandy, J. M., 705.
Gangulee, N., 232.
Ganguly, P. M., 137.
Gansser, A., 758.
Garber, R. J., 31.
Garby, C. D., 805.
Garcia, F., 195, 242.
Gard, 50.
Gardner, F. E., 324.
Gardner, G. H., 278.
Gardner, M. W., 753.
Gardner, W. A., 214, 215.
Garlock, F. L., 795.
Garman, H., 259.
Garman, P., 450.
Garola, C.-V., 419.
Garratt, G. A., 644.
Garrison, H. S., 830.
Gaskill, N. B., 191.
Gater, B. A. R., 253.
Gates, F. C., 745, 791.
Gates, O. H., 299.
Gates, R. R., 126, 127, 330.
Gates, W. H., 627.
Gaudot, G., 546.
Gauhn, E. R., 580.
Gault, L., 420.
Gäumann, E., 250, 542.
Gauntt, E. A., 98.
Gautier, C., 656.
Gavel, F. W., 153.
Gay, C. W., 571.
Gay, M. C., 692.
Gee, N. G., 656.
Geerligs, H. C. P., 411.
Geilinger, H., 202.
Geiser, S. W., 525.
Geldard, W. J., 322.
Genung, A. B., 289.
Gérard, R., 845.
Gerber, H., 786.
Gerdel, R. W., 698.
Gerngross, O., 312.
Gerretsen, F. C., 123.
Gerry, E., 346.
Géry, 134.
Ghosh, D. N., 192.
Gibbons, G. C., 532.
Gibbs, W. M., 512.
Gibson, A., 358.
Gibson, F., 745.
Gibson, H. V., 526.
Gibson, W. H., 340, 531.
Giese, H., 490.
Gieseker, L. F., 720.

Giffard, W. E., 158.
Gilbert, A. H., 853.
Gilbert, A. W., 394.
Gilbert, B. E., 819.
Gilbert, S. J., 678, 760.
Gildow, E. M., 478, 479, 885.
Gile, P. L., 224.
Gill, J. B., 54.
Gillett, L. H., 298.
Gillett, R. L., 417.
Gillette, C. P., 154, 194, 858.
Gillum, L. W., 496.
Gilman, H. L., 678.
Gilmour, G. Van B., 806.
Gilmour, J., 200.
Gimingham, C. T., 556.
Gins, H. A., 79.
Ginsburg, J. M., 98, 815.
Gisborne, H. T., 210, 211.
Gladson, W. N., 598.
Glaser, R. W., 856.
Glasgow, H., 359.
Glatfelter, G. V., 776.
Gleason, H. A., 144.
Glendenning, R., 858.
Glenny, A. T., 677.
Glines, N. W., 636.
Glover, R. E., 887.
Gluud, W., 119.
Gnadinger, C. B., 808.
Gochenour, W. S., 382.
Godkin, J., 849.
Goebel, K., 324.
Goldbeck, A. T., 789.
Goldberg, S. A., 69, 182, 785.
Goldberger, J., 662.
Goldenweiser, E. A., 591.
Golding, J., 377, 880.
Goldman, E. A., 251.
Goldsmith, G. W., 824, 825.
Goldsmith, H. E., 186.
Gonggrijp, L., 540.
Gonzalez, B. M., 369, 374.
Gonzalez, L. G., 537.
Goodale, H. D., 332.
Goodearl, G. P., 791.
Goodner, K. H., 499.
Goodrich, E. S., 627.
Goodwin, W., 506.
Goormaghtigh, N., 525.
Goossens, V., 344.
Gore, H. C., 714.
Gore, H. M., 597.
Gorini, C., 581.
Gortner, R. A., 314, 802.
Gorton, G., 95.
Goss, H., 458.
Goss, R. W., 351.
Gossard, H. A., 798.
Gotley, G. R. H., 244.
Gotoh, K., 426.
Goujon, A., 416, 582.
Govorov, L. I., 231.
Gowdey, C. C., 555.
Gowen, J. W., 72, 781.
Goy, P., 765.
Graber, L. F., 232, 452.
Graf, J. E., 362.
Graf, O., 79.
Grafke, H. M., 78.
Graham, E., 276.
Graham, G. E., 697.
Graham, R., 78.
Graham, R. R., 591.
Graham, S. A., 453.
Graham, T., 802.
Graham, V., 637.
Graham, W. A. P., 620.
Granovsky, A. A., 358, 451.
Grant, I. F., 393.
Grapp, G. H., 580.
Gras, N. S. B., 397.
Gratz, L. O., 44.
Gravatt, A. R., 356.
Graves, A. H., 650.
Graves, H. S., 601.
Graves, L. M., 289.
Gray, D. S., 416.
Gray, D. T., 800.
Gray, F. G., 433.
Gray, H., 65.
Gray, L. C., 289, 706, 793.
Gray, R. W., 508.
Graybill, H. W., 183, 477, 552, 787.
Greaves, J. E., 218, 735, 861.
Greeley, W. B., 100, 598.
Green, H. H., 278.
Green, J. W., 589.
Green, R. M., 534.
Green, W. J., 900.
Greenaway, A. J., 711.
Greenburg, L., 590.
Greene, H. T., 400.
Greene, S. W., 466.
Greenwald, I., 63.
Greenwood, A. W., 631.
Gregg, J., 278.
Gregg, W. R., 210.
Gregory, F. G., 222.
Gress, E. M., 139.
Greswell, E. A., 244.
Griffee, F., 729.
Griffith, J. P., 141, 843.
Griffiths, D., 144, 441.
Griffiths, M. A., 148.
Grijns, G., 269.
Grim, G. W., 178, 580.
Grimmer, W., 380.
Griswold, D. J., 68.
Groff, G. W., 656.
Gross, A. O., 787.
Gross, J., 63.
Grossheim, A. A., 34.
Grove, R. C., 278.
Grubb, N. H., 643.
Gryns, A., 123.
Gryse, J. J. de, 857.
Guba, E. F., 853, 697.
Guberlet, J. E., 57.
Guedeney, 389.
Guercio, G. del, 156, 757.
Guerrant, N. B., 197.
Guerrero, J., 430, 436, 496.
Guild, I. T., 453.
Guillaumin, A., 520.
Guilliermond, A., 727.
Guillochon, L., 134.
Gunn, D., 552.
Gupta, D. N., 811.
Gupta, S. N., 137.
Gurd, F. B., 77.
Gustafson, A. F., 120.
Gustafson, R. K., 278.
Guthrie, E. S., 489.
Gutierrez, M. E., 835.
Guyénot, E., 226.
Guyer, M. F., 330, 426.
Guyton, T. L., 360, 860.
Gwatkin, R., 279.

Haden, R. L., 12.
Hadley, F. B., 478, 479, 885.
Hagan, W. A., 783.
Hagedoorn, A. C., 328, 628.
Hagedoorn, A. L., 328.
Hagedorn, H. C., 206.
Haggard, H. W., 863.
Haglund, E., 581, 882.
Haigh, L. D., 220.
Haines, W. B., 108.
Haines, W. C., 210.
Hale, F., 500.
Hale, H., 781.
Hale, L., 97.
Haley, W. E., 358.
Hall, A. J., 412.
Hall, D. H., 892.
Hall, I. C., 197, 697.
Hall, J. S., 165.
Hall, L. S., 281.
Hall, M. C., 385, 482, 584, 585, 787.
Hall, M. W., 654.
Hall, N., 668, 669.
Hall, R. S., 350.
Hall, T., 676.
Hall, W. J., 53, 653.
Halligan, C. P., 94, 243.
Hallman, E. C., 685.
Hallock, H. C., 455.
Halpin, J. G., 463.
Halton, P., 8.
Halversen, W. V., 418.
Halverson, J. O., 775.
Hamilton, C. C., 559.
Hamilton, G. M., 632.
Hammatt, T. D., 593, 594.
Hammer, B. W., 781, 782.
Hamnrett, F. S., 572.
Hammond, W. E., 570.
Hance, F. E., 409.
Hancock, G. L. R., 760.
Hancock, J. S., 108.
Hand, I. F., 509, 718.
Hansen, 270.
Hansen, A. A., 239.
Hansen, A. H., 895.
Hansen, J., 67.
Hanson, F. B., 31, 130.
Hanson, K. B., 787.

Hanssen, F. S., 474.
Hansson, N., 269, 579, 666, 668.
Harden, A., 801.
Hardenbergh, W. A., 188.
Hardenburg, E. V., 635.
Hardin, G. H., 110.
Hardin, L. J., 198.
Harding, H. A., 580.
Hardy, F., 116, 717.
Hardy, G. H., 160.
Hardy, W. B., 260.
Hargood-Ash, D., 764.
Hargreaves, E., 52.
Haring, C. M., 498.
Harlan, H. V., 426.
Harland, M. B., 32.
Harland, S. C., 230, 537.
Harmuth, L., 412.
Harned, R. W., 453.
Harper, H. J., 11.
Harper, R. M., 596.
Harris, A. E., 598.
Harris, C. W., 282.
Harris, J. A., 268, 626.
Harris, J. W., 898.
Harris, K., 483.
Harris, S., 368, 462.
Harris, W. G., 578.
Harrison, E., 632.
Harrison, F., 898.
Harrison, G. A., 205.
Harrison, H., 684.
Harrison, J. E., 844.
Harrison, J. L., 284, 483.
Harrow, B., 766.
Harry, S. G., 51.
Harshaw, H. M., 176, 464.
Hart, E. B, 379, 463, 464, 473, 870.
Hart, G. H., 180.
Harter, L. L., 752, 753, 854.
Hartman, C., 429.
Hartman, C. G., 631, 732.
Hartman, F. W., 763.
Hartman, H., 440.
Hartnack, H., 583.
Hartwell, B. L., 723, 724.
Hartwell, G. A., 163, 265, 659, 766.
Hartzell, A., 452.
Harvey, A., 891.
Haseman, L., 450, 451.
Hasenbäumer, J., 420.
Haskell, S. B., 214, 289, 598, 706.
Haskins, H. D., 22.
Hassall, A., 855.
Hastings, E. G., 65, 179, 383, 475, 580.
Haswell, J. R., 390.
Hata, S., 583.
Hathaway, J. C., 869.
Hatschek, E., 802.
Hatt, W. K., 83, 84.
Hatton, R. G., 648.
Hauber, J. E., 586.
Haudnroy, P., 479, 480.
Hauge, S. M., 671, 768, 779.
Hauter, L. H., 98.
Hawkins, L. A., 354.
Hawkins, R. S., 234, 419, 733, 829.
Hawley, C. R., 489.
Hawley, I. M., 254.
Hawley, L. F., 718.
Hawthorne, H. W., 897.
Hay, W. D., 735.
Hayden, C. C., 781, 879.
Hayes, F. A., 212.
Hayes, F. M., 381.
Hayes, H. K., 128, 226, 729.
Hayes, W. P., 57.
Hays, C. H., 179.
Hays, F. A., 332.
Hays, W. P., 473.
Haywood, W. G., 220, 622.
Headlee, T. J., 253, 360, 755, 856.
Headley, F. B., 600, 812, 834, 840, 870, 889, 893, 899.
Healy, J. S., 78.
Heath, L. M., 382.
Hecke, G. H., 179.
Hedden, W. P., 289.
Hedlund, T., 632.
Hedrick, U. P., 37.
Hedrick, W. O., 795, 798.
Heelsbergen, T. van, 785.
Heen, C., 277.
Hegdal, P. M., 683.
Heide, F. F. R., 236.
Heil, H., 48.
Heilbron, I. M., 125.
Heinicke, A. J., 642.
Heintz, E. L., 458.
Hekma, E., 206.
Helguera, H., 269.
Heller, V. G., 660.
Helm, C. A., 431.
Helman, F. D., 568.
Helms, O., 552.
Hendel, J., 409.
Henderson, E. W., 471, 472.
Henderson, F. Y., 223.
Henderson, G. S., 175.
Henderson, J. M., 364.
Henderson, Y., 657, 863.
Hendrick, J., 213, 723.
Hendricks, S. B., 110.
Hendrickson, A. H., 754.
Hendrickson, C. I., 797.
Hendry, J. L., 711.
Henley, R. R., 384.
Henniker-Gotley, G. R., 244.
Henning, G. F., 698.
Henry, A. J., 210, 211, 508, 718.
Henry, A. W., 750, 847.
Henry, M., 279.
Hepler, J. R., 438.
Hepner, F. E., 615, 696.
Herbert, D. A., 424.
Herelle, F. d', 581.
Herman, J. R., 690.
Hermann, C. C., 790.
Hermersdörfer, C., 764.
Hernandez, A., 133.
Hernandez, N., 835.
Herrick, G. W., 858.
Herter, C. H., 285, 684, 685.
Herter, K., 699.
Hertwig, R., 314, 807.
Hervey, G. W., 29, 900.
Herzer, F. H., 465.
Herzog, W., 699.
Hess, A. F., 568, 569, 767.
Hetzel, K. S., 368.
Heukelekian, H., 98.
Heulings, S. M., 580.
Heuser, O., 235.
Heys, F., 31.
Hibbard, B. H., 88, 289, 493.
Hibbard, P. L., 715, 719.
Hibbard, R. P., 341.
Hibbert, E., 504.
Hicks, W. H., 674, 868, 870, 874.
Hideo, 831.
Higginbottom, S., 200.
Higgins, B. B., 852.
Higgins, J. E., 538.
Hilden, K., 629.
Hilditch, T. P., 801.
Hilgendorf, F. W., 855.
Hill, C. C., 361.
Hill, E. B., 398, 798.
Hill, J. A., 630, 673, 680, 696.
Hill, L., 764.
Hills, J. L., 667, 705, 706.
Hilson, G. R., 137.
Himbury, W. H., 530.
Himmer, A., 860, 861.
Hinds, W. E., 553.
Hines, (Mrs.) W. L., 499.
Hinner, W., 315.
Hirsch, E. F., 610.
Hirschfelder, A. D., 309.
Hirst, C. T., 218, 861.
Hirst, L. F., 758.
Hiscock, I. V., 580.
Hiscox, E. R., 475.
Hitchcock, E. A., 597, 598, 800.
Hitchens, A. P., 654.
Hoagland, R., 570.
Hobbs, E., 500.
Hobbs, S. H., jr., 898.
Hodgkins, J. A., 294.
Hodgkiss, H. E., 558.
Hodgson, R. G., 376.
Hodgson, R. W., 241.
Hodson, W. E. H., 252.
Hoerner, J. L., 154.
Hoff, W., 617.
Hoffer, G. N., 247.
Hoffman, A. H., 485, 685.
Hoffman, C., 805.
Hoffman, G. W., 289.
Hoffman, W. A., 860.

Hoffman, W. F., 626, 802.
Hoffmann, C., 699.
Hogan, A. G., 464, 466, 570.
Hohenkerk, L. S., 145.
Holben, F. J., 714.
Holbert, J. R., 349, 434, 444.
Holbøll, S. A., 64.
Holdaway, C. W., 578.
Hollingsworth, J. B., 580.
Hollis, S. C., 659.
Holloway, T. E., 358, 361.
Holm, A., 632.
Holman, C. W., 289.
Holman, H. P., 287.
Holmes, A. D., 810, 864.
Holmes, C. L., 289, 896.
Holmes, W. C., 714.
Holth, H., 270.
Holtz, H. F., 216.
Homfray, J., 244.
Honeywell, E. M., 9.
Honeywell H. E., 99, 198, 672.
Hood, C. E., 452.
Hood, E. G., 646, 676.
Hood, W. R., 495.
Hooker, 15.
Hooker, H. D., jr., 38, 241, 436.
Hooker, W. A., 677.
Hooley, C. H., 589.
Hooper, J. J., 428.
Hoover, J. M., 475.
Hoover, M. M., 600.
Hopkins, E. F., 607, 849.
Hopkins, J. A., 89.
Hopkins, M., 390.
Horn, D. W., 580.
Hornberger, W. F., 716.
Hornby, A. J. W., 115, 117.
Horner, J. T., 91.
Horning, J. G., 482.
Horsfall, J. L., 99.
Horton, A. H., 83.
Hoskins, R. G., 733.
Hosoya, S., 162, 163.
Höstermann, G., 148.
Hotchkiss, M., 892.
Housholder, B. W., 339.
Houben, J., 205.
Houck, U. G., 78.
Hough, W. S., 756.
House, C. A., 855.
Houser, J. S., 96, 557.
Householder, B. W., 339.
Houssay, B. A., 562.
Howard, A., 335, 842.
Howard, C. W., 558, 656.
Howard, J. R., 400.
Howard, L. O., 560.
Howard, N. F., 755.
Howard, N. O., 650.
Howard, S. H., 541.
Howard, W. L., 97, 148.
Howe, P. B., 571.
Howell, A. B., 551.
Hoxmark, G., 812.
Hoyt, L. F., 254.
Hubbard, C. M., 70.
Huber, L. L., 361.
Huckett, H. C., 359.
Hudson, R., 374.
Hudson, R. S., 740.
Huestis, R. R., 428.
Huffman, C. F., 379, 780.
Huggins, B. E., 881.
Hugglar, N. A., 178.
Hughes, E. B., 505.
Hughes, G. S., 395.
Hughes, H. D., 435, 636.
Hughes, H. L., 694.
Hughes, J. S., 274, 877.
Hulce, R. S., 571.
Hull, D. C., 197.
Hull, F. E., 399.
Hume, A. N., 34.
Hume, E. M., 264.
Humphrey, C. J., 356.
Humphrey, G. C., 571.
Humphrey, H. B., 891.
Humphreys, W. J., 508.
Hunnius, T., 517.
Hunt, C. H., 571.
Hunt, E. E., 597.
Hunt, G. M., 400.
Hunt, H. R., 251.
Hunt, W. E., 183.
Hunt, W. R., 697.
Hunter, A. C., 761.
Hunter, C., 222.
Hunter, H. C., 718.
Hunter, W. T., 840.
Huntington, A., 400.
Huntington, E., 27, 615.
Hunziker, O. F., 178.
Hurt, R. H., 40.
Huskins, C. L., 829.
Hutcheson, J. R., 800.
Hutchings, C. B., 358.
Hutchinson, C. M., 721.
Hutchinson, R. J., 134.
Hutchison, R., 466.
Hutson, J. B., 891.
Hutton, M. K., 564.
Huxley, T. H., 829.
Hyde, K. C., 347.
Hyslop, G. R., 285, 638.

Iakushkin, I. V., 35.
Ikeler, K. C., 699.
Iljin, W. S., 423.
Illingworth, J. F., 554.
Ilvessalo, Y., 347.
Imanishi, K., 78.
Imatong, S. B., 238.
Imms, A. D., 651, 654.
Ingalls, W. R., 189.
Inglis, C. M., 651.
Irvine, J. C., 801.
Isaac, P. V., 55.
Isaachsen, H., 269.
Isabella, N. M., 284.
Ishii, T., 160.
Ishimori, N., 64.
Israelsen, O. W., 699.
Issatchenko, B., 535.
Itano, A., 25, 619.
Iverson, J. P., 78.

Jack, H. W., 242.
Jack, R. L., 281.
Jackson, B. D., 122.
Jackson, F. H., 483, 790.
Jackson, H. S., 347, 646, 749, 753.
Jackson, R. F., 613, 810.
Jacob, H. E., 690, 744.
Jacob, K. D., 713.
Jacob. M., 78, 179.
Jacobs, K., 91.
Jacquemont, A., 193.
Jahn, G., 94.
Jakl, V. E., 508.
James, E. J., 97.
James, L. H., 59.
James, N., 474.
James, P. E., 210.
Jamieson, G. S., 9.
Janda, H. F., 83.
Janisch, E., 43.
Jank, J. K., 9.
Jansen, W. H., 261.
Janssonius, H. H., 225.
Jardine, W. M., 1, 5, 289, 701, 703, 704.
Jarvis, C. S., 82.
Jarvis, E., 857.
Jarvis, H., 362, 861.
Jauritzen, J. I., 854.
Javillier, M., 10, 408.
Jay, D. A., 397.
Jefferis, A. T., 666.
Jeffers, D. S., 145.
Jefferson, L. P., 490.
Jenkins, E. H., 96, 601, 604.
Jenkins, M. T., 29.
Jennings, D. S., 483.
Jennings, H. S., 329, 430.
Jennings, R. D., 272.
Jensen, H., 198.
Jensen, S. O., 880.
Jesness, O. B., 895.
Jessen, J. B., 269.
Jodidi, S. L., 501, 502, 712.
Joëssel, P. H., 827.
Joest, E., 277.
Joffe, J. S., 18.
Johann, H., 747, 847, 850.
Johannsen, O. A., 262.
John, W. C., 494.
Johnson, A. H., 410, 626.
Johnson, A. N., 598.
Johnson, E., 228.
Johnson, E. C. (Ky.), 399.
Johnson, E. C. (Wash.), 598.
Johnson, F., 768.
Johnson, G. C., 286.
Johnson, G. F., 299, 487.
Johnson, J., 435, 443.
Johnson, J. P., 465.
Johnson, J. S. A., 598.

Johnson, N. W., 198.
Johnson, O. N., 463.
Johnson, O. R., 493, 494.
Johnson, S. R., 786.
Johnson, S. W., 602, 603, 604.
Johnson, T. C., 142.
Johnston, C. G., 526.
Johnston, C. O., 647, 850.
Johnston, I. M., 825.
Johnston, S., 843.
Jonasson, O., 100.
Jones, C. D., 98.
Jones, C. F., 100.
Jones, C. H., 667.
Jones, C. R., 200, 598.
Jones, D. F., 128, 522, 629.
Jones, D. H., 655.
Jones, D. L., 500.
Jones, D. W., 770.
Jones, E. G., 511, 815.
Jones, E. M., 212.
Jones, F. R., 351, 443.
Jones, G. H., 335.
Jones, J. D., jr., 179.
Jones, J. H., 870.
Jones, J. O., 503.
Jones, K. U., 197.
Jones, L. R., 199, 397, 443, 849.
Jones, M. M., 66, 482.
Jones, R., 336.
Jones, R. L., 216.
Jones, W. D., 694.
Jones, W. F., 581.
Jones, W. N., 324.
Jong, W. de, 270.
Jordan, E. L., 499.
Jordan, E. O., 609.
Jordan, J. O., 580.
Jordan, R., 456, 580.
Jørgensen, C. O., 236.
Jorgenson, G. E., 887.
Jorgenson, L., 600.
Joseph, A. F., 108, 722, 814.
Joseph, W. E., 70.
Joshi, N. V., 514.
Joslin, E. P., 368.
Jost, L., 623.
Juday, C., 386.
Judd, O., 602.
Judkins, H. F., 883.
Julien, R. C., 786.
Julius, E., 441.
Justin, M., 707.
Justin, M. M., 800.

Kable, G. W., 486.
Kaczmarek, J., 566.
Kadel, B. C., 210.
Kahn, A. Y. A., 632.
Kalmbach, E. R., 856.
Kalshoven, L. G. E., 259.
Kammerer, P., 230.
Kammlade, W. G., 88.
Kannan, K. K., 257, 259.
Karny, H. H., 556.
Károly, R., 796.
Karpechenko, G. D., 730.
Karper, R. E., 27, 500.
Kasai, M., 151.
Katayama, T., 375.
Kaufman, E. E., 691.
Kaufman, L., 100.
Kaupp, B. F., 681, 779, 786, 793.
Kawamura, Y., 79.
Kayser, E., 322.
Kaznowski, L., 337.
Keane, J. C., 613.
Keen, B. A., 108.
Keesee, J. T., 775.
Keifer, H. H., 857.
Keith, M. H., 168.
Keitt, G. W., 443, 548.
Kelley, M. A. R., 399, 400, 571.
Kelley, R. W., 856.
Kellogg, J. H., 266.
Kellogg, R. M., 486.
Kelly, C. D., 178.
Kelp, I., 268.
Kelsey, D. S., 798.
Kelsey, H. P., 122.
Kelsey, K., 719.
Kemner, N. A., 652.
Kempster, H. L., 71, 273, 471, 472.
Kempton, F. E., 748.
Kendall, F. E., 204.
Kendall, J. C., 497, 800.
Kennard, D. C., 71, 273, 577, 873, 876, 892.
Kennedy, P. B., 633, 737.
Kennedy, W. P., 833.
Kent, C. C., 358.
Kern, F. D., 600.
Kern, R. R., 797.
Kernkamp, H. C. H., 786.
Kerr, R. W., 204.
Kessel, J. F., 553.
Ketchum, M. S., 388, 800.
Keyworth, C. M., 315.
Khan, A. R., 531.
Kidder, A. F., 528, 850.
Kienholz, R., 623.
Kiernan, J. R., 78.
Kiesselbach, T. A., 433, 523.
Kii, N., 61.
Kik, M. C., 876.
Kikuchi, A., 536.
Kilgore, B. W., 798.
Killand, T. K., 132, 140, 528, 535.
Killby, L. G., 532.
Killian, C., 519.
Killough, D. T., 500, 647.
Kilpatrick, W. H., 597.
Kimball, H. H., 210, 508, 718.
Kimbrough, W. D., 635, 636.
Kincer, J. B., 111.
King, B. M., 234.
King, C. L., 288.
King, C. M., 486.
King, (Mrs.) F., 144.
King, F. G., 465, 570.
King, H. H., 153, 158.
King, J. L., 455.
King, J. S., 689.
King, J. T., jr., 764.
King, R. L., 226.
Kingsbury, A. N., 459.
Kinnison, A. F., 733, 740.
Kinsey, F. S., 895.
Kinzel, W., 828.
Kirby, R. S., 348, 627.
Kirk, L. E., 129, 229.
Kirkpatrick, E. L., 692.
Kirkpatrick, T. W., 755.
Kiser, O. M., 169, 170.
Klaphaak, P. J., 22.
Klein, J., 858.
Kleine, R., 860.
Klemmedson, G. S., 168.
Kligler, I. J., 886.
Klimmer, M., 884.
Klott, C., 123.
Klotz, L. J., 122.
Knapp, B., 507.
Knapp, G. S., 282.
Knapp, J. V., 78.
Knaus, K., 98.
Knecht, E., 504.
Kneeland, H., 508.
Kneeland, Y., jr., 165.
Knibbs, N. V. S., 621.
Knight, E., 81, 82.
Knight, E. W., 812, 834, 840, 870, 889, 893, 899.
Knight, H., 453.
Knight, H. G., 96, 174, 800.
Knight, R. C., 222, 643.
Knobel, E. W., 417, 616.
Knoch, H. H., 286.
Knowles, C. H., 859.
Knowles, C. R., 892.
Knowles, F., 502.
Knowles, R. H., 583.
Knowlton, H. E., 39.
Knull, J. N., 860.
Koch, F. C., 107.
Koehler, A., 504.
Koehler, B., 349, 434, 444, 850.
Koehler, W. B., 630.
Koehne, M., 570.
Koenen, S., 270.
Koeppe, S., 382.
Koestler, A. G., 276.
Koestler, G., 700.
Köhler, E., 46.
Kohman, E. F., 208, 566, 764.
Kohs, K., 424.
Köketsu, R., 823.
Kokkonen, P., 282.
Kolb, J. H., 487.
Kolmer, J. A., 77.
Kolthoff, I. M., 610.
Komuro, H., 519.
König, J., 420.
Konno, T., 82.

Korenchevsky, V., 262, 563, 665.
Kořínek, J., 424.
Korstian, C. F., 145.
Kotila, J. E., 751, 853.
Kotlan, A., 787.
Kottur, G. L., 350.
Kountz, W. B., 526, 732.
Kramer, R. M., 295.
Krantz, F. A., 425, 628, 635.
Krasnow, F., 766.
Kratz, A. P., 686.
Kraus, I., 715.
Krauss, W. E., 675.
Kress, C. B., 105.
Kress, O., 356.
Krey, F., 621.
Krikorian, K. S., 678.
Kriss, M., 271, 573.
Kristofferson, K. B., 630.
Křiženecký, J., 100, 270.
Krohn, L. D., 786.
Krokos, V., 213.
Kronacher, C., 267, 269.
Kroon, H. M., 29, 269.
Krout, W. S., 754.
Krueger, J., 598.
Krüger, W., 235.
Krum, O. C., 487.
Krumwiede, C., 786.
Kudrjawzewa, A., 164, 766.
Kuenning, A. C., 509, 529, 591, 599.
Kühne, G., 286, 400.
Kühr, C. A. H. Von W., 353.
Kuleshoff, N., 535.
Kunhi Kannan, K., 257, 259.
Kuntz, P. R., 133.
Kuntz, W. A., 196.
Kupreenok, P., 322.
Kuroya, M., 162, 163.
Kurz, H., 125.
Kuwana, I., 157.
Kuyper, J., 34, 119.
Kyle, E. J., 598.

Labbé, M., 458.
Lackey, J. B., 98, 288.
Lacroix, J. V., 677.
Lacy, M. G., 91, 288, 297, 493.
Ladd, E. F., 98, 705.
Lagassé, F. S., 498.
Lagoanere, J. L. de, 582.
Lajeunesse, S. L.-, 10, 408.
Lamar, J. E., 621.
Lamb, A. B., 323.
Lamb, A. R., 498, 571.
Lambert, J. C., 488.
Lambert, T., 724.
Lampe, L., 421.
Lamprt, L. H., 505.
Lamson, G. H., jr., 785.
Lamson, P. D., 278.
Lander, P. E., 632.
Lane, C. H., 298.
Lane, J. H., 505.
Lane, M. C., 363.
Lane, W. A., 367.
Lang, E., 200.
Lange, L. B., 866.
Langer, H., 80.
Langford, G. S., 858.
Langsford, E. L., 699.
Lantow, J. L., 369.
Lapicque, L., 700.
Larbaud, M., 728.
Larimore, L. D., 165.
Larison, E. L., 804.
Larsen, L. M., 810.
Larsen, O. H., 392, 596.
Larson, A. O., 159.
Larson, J. A., 210, 211.
La Rue, A. de, 855.
La Schum, E. E., 187.
Lathouwers, V., 230.
Lathrop, C. P., 803.
Lathrop, E. A., 396.
Lathrop, E. C., 503, 522.
Lathrop, F. H., 363, 452, 500.
Laude, H. H., 528.
Laur, E., 290, 591, 700.
Lauritzen, J. I., 752.
Lavenir, P., 882.
Lavier, G., 786.
Lavis, C. A., 798.
Lawrence, M., 457.
Lazier, W. A., 204.
Leach, B. R., 453, 455.
Leach, J. G., 545.
League, B., 631.
Lean, O. B., 55.
Leavenworth, C. S., 712.
Lebailly, C., 886.
Lebediantzeff, A., 419.
Lebedjantzev, A. N., 18.
Lebermann, F., 206.
Le Breton, T. A., 693.
Lee, M. O., 526.
Leeming, E. L., 388.
Lees, A. H., 357.
Leete, B. E., 798.
Lefevers, A. P., 775.
Leffmann, H., 125.
Legat, C. E., 645.
Léger, C., 272.
Legg, A. T., 222.
Lehman, S. G., 746.
Lehmann, E. W., 399.
Lehne, A., 812.
Leiby, R. W., 755.
Leidigh, A. H., 509.
Leighty, C. E., 425.
Leith, B. D., 426.
Leland, O. M., 598, 800.
Leleez, B. P.-, 10.
Lemmermann, O., 20, 418.
Lenfest, R. E., 250.
Lengerken, H. von, 652.
Lengyel, G., 340.
Lennes, N. J., 194.
Leonard, M. D., 454.
Leopold, R., 120.
Lepeschkin, W., 809.
Lepkovsky, S., 866.
Lesage, P., 521, 626.
Leslie, R. F., 580.
Lesne, P., 259.
Lester, V., 12.
Lestoquard, F., 182, 183, 482.
Leukel, W. A., 196.
Leuschner, F. H., 877.
Levine, M., 86.
Levine, M. N., 847, 848.
Lévy-Lajeunesse, S., 10, 408.
Lewicki, S., 332.
Lewis, E. A., 90.
Lewis, H. B., 261.
Lewis, I. P., 548.
Lewis, M. R., 86.
Lewis, M. T., 99.
Lewis, P. A., 889.
Lewton, F. L., 337.
Libanio, S., 357.
Lichtenfelt, 597.
Lichtin, A., 456.
Lignières, J., 680.
Lindegren, C. C., 348, 540.
Linden, B. A., 761.
Lindet, L., 421.
Lindhard, E., 336.
Lindsay, B., 526.
Lindsey, J. B., 473.
Lindstrom, E. W., 29, 30.
Linford, M. B., 443.
Link, G. K. K., 648, 849.
Link, K. P., 107, 199, 803.
Lint, H. C., 724.
Lipman, C. B., 215.
Lipman, J. G., 219, 322, 598, 710, 724, 800.
Lippincott, W. A., 407.
Lippmaa, T., 627.
Lipscomb, J. N., 197.
Liró Ortiz, L., 137.
Lisboa, M., 857.
List, G. M., 154.
Little, B. C., 463.
Little, C. C., 107, 375, 627.
Lively, C. E., 608, 898.
Livingston, B. E., 224.
Livingston, L. F., 399.
Lloyd, B., 427.
Lloyd, E. M. H., 592.
Lochhead, G., 25.
Lochte, H. L., 805.
Lockwood, W. P. B., 580.
Loeb, J., 100.
Loftfield, J. V. G., 824.
Lohmann, W., 516.
Löhner, L., 100.
Löhnis, F., 25.
Lomanitz, S., 310.
Lomax, K., 475.
Long, E., 824.
Long, F. L., 728.
Long, J. D., 590.
Long, L. E., 197.
Longo, A., 148.
Longo, B., 844.
Loomis, A. M., 289.

Loomis, W. E., 36.
Lopez, C., 381.
López Domínguez, F., 121, 133.
Lord, C. E., 50.
Lord, E. M., 732.
Lord, L. J., 276.
Lorette, L., 641.
Lory, C. A., 597.
Loudon, A. N., 389.
Lounsbury, C., 416, 616.
Lovat, 645.
Lovett, A. L., 148, 253.
Lowdermilk, W. C., 845.
Lowe, E. P., 416.
Lowry, M. W., 212.
Lowry, P. R., 451.
Lubbehusen, R. E., 180, 384.
Lubimenko, V., 518, 727, 827.
Lucan, N. S., 80.
Lucas, E. W., 380.
Luce, E. M., 177, 502.
Ludwig, C. A., 750.
Ludwig, H., 887.
Lull, R. S., 27.
Lundh, E., 346.
Lundie, A. E., 455.
Lundsgaard, C., 64.
Lush, J. L., 731.
Lute, A. M., 135.
Lutes, D. T., 694.
Lutjeharms, D., 824.
Lutz, A., 357.
Lyle, C., 51.
Lyle, M. S., 898.
Lyon, D. M., 569.
Lyon, L. S., 393.
Lyon, T. L., 642.

McAdams, A. J., 891.
McAlpine, J. G., 80.
MacArthur, J. W., 427.
McAtee, W. L., 856.
McBride, C. G., 698.
MacBride, C. S., 580.
MacBride, E. W., 425.
McCalip, M. A., 716.
McCall, M. A., 719.
McCampbell, C. W., 66, 531, 571.
McCandless, J. M., 611.
McCarrison, R., 59.
McCarthy, D. F., 811.
McCarty, M. A., 571, 575.
McCaustland, E. J., 598.
McChord, R. C., 771.
McClendon, G. C., 578.
McClintock, J. A., 47, 649.
McCluskey, K. L., 12.
McColloch, J. W., 361, 458.
McCollum, E. V., 289, 660, 766, 767.
McConnell, W. J., 161.
MacCorquodale, D. W., 204.
McCue, C. A., 598.
McCuen, G. W., 688.
McDiarmid, R. W., 483.
McDole, G. R., 509, 511, 514, 528, 509.
McDonald, C. W., 571.
McDonald, J., 147, 246.
MacDonald, M. B., 699.
MacDougal, D. T., 517, 624, 625, 821, 822.
McDougall, W. B., 744.
MacDowell, E. C., 732.
McDowell, J. C., 676.
McDowell, M. S., 800.
McElroy, J. J., 600.
McFadyean, J., 79, 584, 678.
McFall, R. J., 289.
McFarland, J. H., 41.
Macfie, J. W. S., 386.
McGee, J. M., 621.
McGeorge, W. T., 829.
MacGill, E. I., 260.
MacGillivray, J. H., 97.
McGinty, D. A., 261.
McGowan, F. R., 737.
McGowan, J. P., 161.
Macgregor, D. H., 93.
Mach, F., 20.
McHardy, D. N., 84.
McHargue, J. S., 310, 864.
McIlvaine, T. C., 31.
MacIntire, W. H., 320, 321, 517.
M'Intosh, 252.
McIntosh, R. A., 279.
McKay, J. G., 483, 790.
McKee, A. J., 482.
McKee, C., 34, 236, 790.
McKee, C. M., 784.
McKee, J. M., 289.
McKellip, I., 473.
McKenzie, F. F., 468.
MacKenzie, N. D., 867, 873, 875.
McKerral, A., 31.
McKesson, C. L., 83, 84.
Mackey, A. K., 68, 198.
Mackie, J. R., 335.
Mackie, W. W., 52, 633.
McKillican, W. C., 534.
McKinney, H. H., 349, 783, 848, 851.
Mackintosh, J., 377.
Mackintosh, W. A., 592.
Macklin, T., 289, 487, 693.
McLaine, L. S., 361.
McLean, F. T., 325, 819, 822.
McLean, H. C., 322, 724.
Maclean, I., 367.
Maclean, I. S., 502.
McLean, W., 10.
McMaster, A. R., 192.
McMeekin, T. L., 107.
Macmillan, H. F., 844.
MacMillan, H. G., 648.
MacMillan, J. H., jr., 314.
MacMillan, W. B., 42.
McMunn, R. L., 547.
McNary, J. V., 683, 684.
McNeal, W. B., 800.
McNeil, J. H., 72.
McNess, G. T., 500.
McNutt, G. W., 631.
McPhee, H. C., 27.
McPheeters, W. H., 83.
McPherson, J. B., 667.
Macself, A. J., 644.
McWhorter, F. P., 851.
Maerker-Braden, A. P., 230.
Magee, H. E., 663, 664, 665.
Magers, E., 569.
Magnuson, H. P., 320, 512.
Mahalanobis, P. C., 632.
Maheux, G., 856.
Mahoney, C. H., 500.
Maier-Bode, F. W., 357.
Maige, A., 826.
Mains, E. B., 347, 646, 749.
Maire, E. D., 278.
Maitland, V. K., 644.
Major, R. H., 368.
Major, T. G., 340.
Makhiv, G., 213.
Malcolm, P., 179.
Malden, W. J., 898.
Malfitano, G., 725.
Malloch, J. R., 55.
Mallory, F. B., 267.
Mally, C. W., 56, 257.
Malterre, 605.
Mamgain, B. D., 244.
Maneval, W. E., 123, 442.
Mange, C. E., 608.
Mangels, C. E., 838, 839.
Mangelsdorf, P. C., 29, 629, 697.
Mangenot, G., 519, 725.
Manhart, V. C., 177.
Manning, G. P., 284.
Manter, J. A., 456.
Maquenne, L., 826.
Marble, L. M., 287.
Marbut, C. F., 114.
Marbut, L., 687.
Marchadier, 416.
Marchadier, A.-L., 582.
Marchand, B. de C., 510.
Marcille, R., 507.
Marcovitch, S., 357, 556.
Marcq, J., 270, 867.
Margosches, B. M., 8, 315.
Marine, D., 82.
Maris, P. V., 598, 800.
Markuson, M. J., 197.
Marloth, R., 610.
Marquez, S., 348.
Marsh, M. E., 366.
Marshall, H. C., 491.
Marshall, R. E., 440, 748.
Marston, H. W., 370.
Martin, E., 465.
Martin, F. J., 108.
Martin, H. (England), 506.
Martin, H. (Germany), 277.
Martin, H. M., 384.
Martin, J. H. (Ky.), 376, 577, 578, 878.

Martin, L. J., 898.
Martin, R. F., 335.
Martin, W. H. (N. J.), 546.
Martin, W. H. (Pa.), 178.
Martini, E., 652.
Marvel, C. S., 204, 261.
Marzell, H., 728.
Mason, F. A., 408.
Mason, R. H., 465.
Mason, T. G., 335.
Massee, A. M., 558, 561.
Mastio, F., 838.
Masurovsky, B. I., 900.
Matheson, K. J., 475.
Mathews, O. R., 334.
Mathews, R., 97.
Mathewson, A. A., 359.
Matson, J., 269.
Matsumura, S., 858.
Matthews, H. A., 615.
Matthews, R. R., 286.
Matthews, V., 340.
Matthey, R., 55.
Mattick, A. T. R., 380.
Mattoon, W. R., 41.
Maughan, M. O., 580.
Maume, 20.
Mavor, J. W., 428.
Maw, W. A., 273.
Mawer, S., 667.
Maxcy, K. F., 360.
Maximow, N. A., 518.
Maxwell, C. H., jr., 571.
Maxwell, R. B., 99.
May, H. G., 629, 786.
May, R. W., 790.
Maynard, L. A., 69, 675, 697, 867.
Mayo, C. H., 179.
Mayr, H., 644.
Mazzocco, P., 562.
Meacham, F. T., 776.
Mead, E., 797.
Mead, S. W., 175.
Meadows, W. R., 293.
Medes, G., 526.
Medina, R., 693.
Meek, V., 280.
Meinzer, O. E., 890.
Melchers, L. E., 349, 751, 850.
Mellon, M. G., 714.
Mellor, E., 50.
Meloy, G. S., 634.
Melvin, B. L., 193.
Menaul, P., 66.
Mendel, L. B., 63, 364, 566.
Menéndez Ramos, R., 183, 147, 195.
Merchant, C. H., 697.
Mercier, A. A., 787.
Merkenschlager, F., 24.
Merrill, A. S., 194.
Merrill, A. T., 562.
Merrill, E. D., 496.
Merrill, J. H., 196, 259.
Mertz, W. M., 152.
Merwe, C. P. van der, 358.
Merwe, C. R. van der, 616.
Mesdag, J., 270.
Metalnikov, S., 28, 54.
Metcalf, H., 651.
Metcalf, W., 42, 243.
Mewborne, R. G., 452.
Meyer, D., 516.
Meyer, E., 286.
Meyer, L. M., 265.
Meyers, M. K., 266.
Meyers, M. T., 421.
Mickel, C. E., 551.
Mickle, F. L., 412.
Middleton, G. W., 463.
Milam, A. B., 800.
Milbrath, D. G., 43.
Milburn, H. M., 790.
Miles, L. M., 460.
Millar, C. E., 319, 815.
Miller, A. E., 656, 899.
Miller, A. W., 178.
Miller, E. J., 798.
Miller, E. R., 570.
Miller, H. G., 62.
Miller, J. D., 289.
Miller, L. B., 487, 683.
Miller, M. F., 414, 431, 598.
Miller, M. R., 478.
Miller, P. E., 113, 119, 131, 140, 171, 195.
Miller, P. L., 895.
Miller, P. S., 590.
Miller, R. C., 69, 571.
Miller, W. L., 287, 486.
Mills, R. G., 659, 859.
Mimeur, J., 361.
Minchin, A. F., 146.
Minott, C. W., 453.
Misner, E. G., 391, 892.
Mitchell, C. A., 503.
Mitchell, G. A., 683.
Mitchell, G. E., 516.
Mitchell, H. S., 763.
Mitchell, L. C., 806.
Mitra, M., 542.
Mitra, S. K., 137.
Miyake, K., 19, 117, 219.
Mogendorff, N., 98.
Mohler, J. R., 179, 278.
Mohlman, F. W., 288.
Mohr, O. L., 729.
Mohr, W., 203, 276.
Mohs, K., 261.
Moll, J. W., 225.
Möllgaard, H., 269.
Molliard, M., 519.
Molz, E., 543.
Monie, M. M., 218.
Monod, T., 270, 678.
Monro, H. C., 160.
Monroe, C. F., 580.
Monroe, D., 899.
Monteith, J., jr., 849.
Montemartini, L., 329.
Montgomerie, R. F., 586.
Montreuil, J. E., 340.
Monvoisin, A., 581.
Moomaw, L., 316, 333, 398.
Moore, B., 144.
Moore, C. R., 428, 524.
Moore, E. L., 580.
Moore, E. W., 419, 431, 497.
Moore, H. C., 635.
Moore, P., 86.
Moore, R. A., 232, 435.
Moore, V. A., 178, 183, 783.
Moore, W., 78, 452.
Morada, E. K., 744.
Morávek, V., 423.
Moreland, R. W., 759.
Morera, V., 562.
Morgan, A. C., 452.
Morgan, A. F., 62.
Morgan, E. L., 493, 494.
Morgan, H. A., 800.
Morgan, H. P. H., 589.
Morgan, M. F., 814.
Morgen, A., 672.
Morgulis, S., 268.
Morison, C. B., 161.
Morison, F. L., 688, 698, 790.
Moritz, A. R., 763.
Mörkeberg, P. A., 270.
Morris, H. F., 500.
Morris, V. N., 714.
Morrison, F. B., 497, 571, 598.
Morrison, H., 359.
Morrow, E. B., 439.
Morse, F. W., 224.
Morse, P. A., 98.
Morse, S. F., 249.
Morstatt, H., 553.
Mortara, G., 596.
Mortensen, M., 178.
Mortimer, E., 366.
Morton, J. W., 343, 641.
Moses, B. D., 486.
Moss, H., 286.
Mottet, S., 41, 845.
Mount, F. P., 400.
Mousset, 389.
Moxon, H. L., 804.
Mueller, E. F., 684.
Muesebeck, C. F. W., 861.
Muir, A. B., 630.
Mukerjee, J. N., 422.
Mukerji, J. N., 531, 533, 720.
Mulany, H. M., 200.
Muldrow, M. W., 170.
Mulford, F. L., 695.
Müller, H. C., 543.
Muller, H. J., 330.
Müller, K. O., 128.
Mullie, G., 270.
Mumford, F. B., 468, 497, 598, 706, 709.
Mumford, H. W., 498, 598.
Munn, M. T., 799.
Munson, J. J., 499.
Murdock, V., 191.
Murlin, J. R., 368.

Murneek, A. E., 142.
Murphey, H. S., 631.
Murphy, H. F., 31, 119, 420.
Murphy, P., 43, 244.
Murphy, R. C., 508, 756.
Murray, J. M., 375.
Murray, W. S., 598.
Murwin, H. F., 435.
Musgrave, G. W., 135.
Mussehl, F. E., 273, 671.
Musselman, H. H., 387, 399, 588.
Muttkowski, R. A., 51.
Myers, C. E., 800.
Myers, C. H., 634, 697.
Myers, K. H., 88.
Myers, P. R., 160.
Myers, W. I., 697.

Nacion, C. C., 350.
Nagao, M., 81.
Nakamiya, J., 660.
Nakamura, H., 364.
Nakamura, K., 19, 219.
Nakamura, Y., 81.
Nakashima, K., 894.
Nakatomi, S., 831.
Namikawa, I., 123.
Narasimhan, M. J., 152.
Narayan Rao, M. A., 363, 786.
Nason, W. C., 193.
Nassau, E., 265.
Naude, P. J., 736.
Navarro, L., 157.
Neale, P. E., 71.
Neckel, G., 728.
Needham, G. H., 807.
Needham, J. G., 252.
Neethling, E. J., 530.
Neidig, R. E., 320.
Neiswander, C. R., 361.
Neller, J. R., 820.
Nelson, D. H. (Mo.), 76, 77.
Nelson, D. H. (Utah), 735.
Nelson, E. K., 13, 105, 803.
Nelson, E. M., 264.
Nelson, J. B., 479.
Nelson, J. H., 596.
Nelson, L., 797.
Nelson, M., 485.
Nelson, M. T., 865, 866.
Nelson, N. T., 232, 432.
Nelson, R., 355, 646, 849.
Nelson, V. E., 105, 381, 660, 767, 866.
Ness, H., 643.
Neubauer, H., 319.
Nevens, W. B., 533.
New, G. F., 337.
Newhall, A. G., 650, 851.
Newkirk, W. B., 111.
Newlands, G., 720.
Newman, H. G., 480.
Newman, L. J., 56.
Newsom, I. E., 179.
Newstead, R., 257.
Newton, J. H., 154.
Newton, W., 221.
Nicholls, P., 684.
Nichols, G. E., 27.
Nichols, J. E., 667.
Nichols, M. L., 487, 588, 683.
Nichols, P. F., 209.
Nicholson, G., 233.
Nicholson, S. W., 797.
Nicolas, E., 326, 521, 726.
Nicolas, G., 326, 521, 726.
Nielsen, N. I., 691.
Nightingale, G. T., 98, 900.
Niimi, D., 679.
Niklas, H., 115.
Niklewski, B., 321.
Nikolov, T., 344.
Nilsson, G., 633.
Nilsson, N. H., 800.
Nisikado, Y., 151.
Nisonger, H. W., 400.
Nitcher, C., 877.
Nobles, C. R., 68.
Nodder, C. R., 531.
Noer, O. J., 416.
Noffray, E., 544.
Noland, R. C., 881.
Nolla, J. A. B., 250.
Normark, P., 165.
Nörr, J., 889.
Norris, E. B., 598.
Norris, L. C., 378, 675.
North, D. S., 547.
Norton, H. W., jr., 178.
Noter, R. de, 640.
Nottelmann, H., 891.
Nottin, P., 421, 504.
Nourse, E. G., 598, 796.
Noyons, A. K., 315.
Nunn, W. G., 609.
Nuttall, G. H. F., 856.
Nutter, J. W., 428.
Nyhus, P. O., 298.
Nystrom, A. B., 175.

Obaton, F., 521.
Oberholser, H. C., 51.
Obré, F., 505.
O'Brien, R., 598.
O'Brien, R. A., 679.
Ocfemia, G. O., 853.
Odén, S., 16, 212.
Odland, T. E., 31.
Ohlmer, E., 672.
Okada, K., 831.
O'Kane, W. C., 451.
O'Kelly, J. F., 234.
Olcott, M. T., 91, 896.
Olesen, R., 663.
Olitsky, P. K., 547.
Olmsted, F. L., 122.
Olney, A. C., 898.
Olsen, A. G., 9.
Olson, O., 733, 753.
Ong, E. R. de, 52.
Ongaro, G., 819.
Onodera, I., 215.
Oosthuizen, J. du P., 736.
Opitz, 339.
Orcutt, M. L., 182.
Orla-Jensen, S., 880.
Orlov, A. A., 138.
Orr, H. W., 369.
Orr, J. B., 172, 665.
Ortiz, L. L., 137.
Ortlepp, R. J., 280.
Orton, C. R., 649, 733, 753, 799.
Orwin, C. S., 93, 190.
Osborne, T. B., 63, 364, 566.
Oslund, R., 428.
Osmun, A. V., 444, 852.
Osten, H., 168.
Ostertag, Von, 270.
Ostrander, J. E., 113, 413, 719.
Oswald, A., 309.
Otrygan'ev, A. V., 339.
Overholt, V., 589.
Overman, O. R., 176.
Overpeck, J. C., 839.
Owen, B. J., 387.
Owen, O., 640.
Owen, W. L., 612, 613.

Pack, D. A., 738.
Pack, H. J., 699.
Page, C., 539.
Page, H. J., 711, 801.
Page, L. A., 775.
Pagliano, 157.
Paguirigan, D. B., 835.
Paillot, 255.
Paillot, A., 255.
Paillthorp, R. R., 895.
Paine, H. S., 613, 811.
Painter, T. S., 523.
Palazzo, F. C., 244.
Palladin, A., 164, 165, 766.
Palmer, A. H., 615.
Palmer, C. C., 279.
Palmer, G. T., 200.
Palmer, L. S., 176, 573.
Panganiban, E. H., 817.
Panisset, L., 81.
Pantanelli, E., 231.
Pape, F. E., 42.
Pappenheimer, A. M., 165.
Paravicini, E., 46.
Pardee, J. T., 281.
Parfitt, E. H., 792, 882.
Park, E. A., 366.
Park, J. B., 698.
Parker, B. M., 694.
Parker, J. H., 338.
Parker, M. E., 882.
Parker, R. R., 58.
Parkhurst, R. T., 86.
Parks, H. B., 456.
Parmantier, P., 894.
Parrish, R. L., 376.
Parrot, L., 182.
Parrott, P. J., 359.
Parshall, R. L., 184.

Parsons, H., 459.
Partridge, N. L., 40.
Passino, F., 269.
Pate, W. F., 218, 723.
Paterson, N. F., 618.
Patten, B. M., 577.
Patterson, H. J., 398.
Patton, J. W., 786.
Patton, M. J., 100.
Pauls, J. T., 83.
Pavlov, D. P., 393.
Payne, F., 30.
Payne, L. F., 274.
Payne, N. M., 361.
Peairs, L. M., 455.
Pearce, S. D., 667.
Pearce, W. T., 389.
Pearl, R., 100, 332.
Pearson, F. A., 795.
Pearson, R. A., 402, 403, 597.
Pederick, W. O., 374.
Pederson, F. C., 145.
Peirce, F. T., 33.
Peirson, H. B., 358.
Pellew, C., 331, 522.
Peltier, G. L., 351.
Pember, F. R., 216, 325.
Pemberton, C. E., 551.
Peukava, J., 828.
Pennington, L. H., 550.
Pepin, J. A., 219.
Pérard, C., 280.
Perkins, A. E., 798.
Perkins, A. J., 350.
Perkins, A. J., 327, 328.
Perkins, S. O., 616.
Perret, C., 45.
Perry, A. M., 85.
Petch, C. E., 358.
Petch, T., 49, 556.
Peter, A. M., 376, 577, 878.
Peters, 270.
Petersen, H. A., 81.
Petersen, N. F., 523.
Petersen, W. E., 109.
Peterson, A., 53, 360, 653, 755.
Peterson, D., 98.
Peterson, E. G., 800.
Peterson, W., 483.
Peterson, W. H., 65, 106, 716.
Petit, A., 134.
Petroff, S. A., 583.
Petrunkevitch, A., 27.
Petry, E. J., 436.
Pettigrove, H. R., 339.
Pettinger, N. A., 850.
Pettit, R. H., 37, 158, 557.
Peyre, M., 193.
Pézard, A., 180, 632.
Phelps, I. K., 807.
Phillips, A. G., 779.
Phillips, C. L., 9, 614.
Phillips, P., 682
Phillips, E. H., 254.
Phillips, W. D., 876.
Phillips, S. W., 814.
Philp, G. L., 344.
Picado, C., 517.
Picard, F., 56.
Picken, M. B., 496.
Pierstorff, A. L., 358.
Pietruszczyński, Z., 322.
Piettre, M., 418.
Pigott, M. G., 864.
Pilkey, A. M., 174.
Pilloud, L., 358.
Pinckney, A. J., 409.
Pinckney, R. M., 417.
Piper, A. M., 83.
Piper, C. S., 666.
Piper, C. V., 336.
Pirocchi, A., 269.
Pirovano, A., 329.
Pisarev, V., 35.
Plaisant, A., 90.
Plank, G. M. van der, 269.
Plantureux, E., 182.
Platon, J. B., 765.
Platt, C. S., 877.
Platt, F. L., 671.
Plessis, A. M. du, 844.
Plimmer, R. H. A., 367, 801.
Plimmer, V. G., 367.
Plumb, C. S., 571.
Plunkett, O. A., 355.
Plymen, F. J., 618.
Pohorecka-Lelesz, B., 10.
Policard, A., 725.
Politis, J., 726.
Pollard, C. B., 375.
Polonovski, M., 313.
Pomeroy, A. W. J., 254.
Pomeroy, C. S., 643.
Ponder, E., 278.
Ponniah, D., 259.
Pool, R. J., 123.
Poore, H. D., 13.
Pope, C. G., 677.
Pope, M. N., 426.
Popenoe, C. H., 452.
Popoff, M., 100, 520.
Popovoi, G., 188.
Porter, A., 884.
Porter, B. A., 154, 454.
Porter, D. R., 544.
Poskin, A., 42.
Post, G. B., 363.
Potapov, A., 238.
Potter, A. A., 349, 590, 598.
Potter, E. L., 894.
Potter, G. F., 437, 447.
Potter, J. E., 783, 784.
Potter, W. H., 210.
Potts, A. T., 500.
Poutiers, R., 157.
Powell, E. B., 510.
Power, E., 93.
Power, F. B., 159.
Powers, R., 209.
Prack, L. von, 793.
Pratt, S., 422.
Pregl, F., 714.
Prell, H., 861.
Prentiss, A. M., 711.
Prescott, J., 386.
Prescott, J. A., 527, 819, 837.
Prescott, S. C., 882.
Pressley, E. H., 734.
Preston, H. H., 794.
Pretyman, E. G., 582.
Preziuso, L., 182.
Prianichnikov, 726.
Prianishnikov, D. N., 515.
Price, H. B., 289.
Price, R. C., 231.
Price, W. H., 580.
Priestley, H. I., 596.
Priestley, J. H., 220, 236.
Prince, A. L., 16, 219, 416, 619.
Prince, F. S., 197.
Prjanischnikow, D. N., 515.
Proebsting, E. L., 725.
Proffitt, M. J., 613, 810.
Proudfit, F. T., 456.
Proudley, C. E., 483.
Provost, D. J., 786.
Prucha, M. J., 178.
Pugsley, C. W., 800.
Pulver, H. E., 284.
Punnett, R. C., 331, 877.
Puntoni, V., 79.
Punzalan, E. S., 538.
Purnell, F. S., 697.
Putnam, G. W., 339.

Quanjer, H. M., 43, 244, 852.
Quayle, W. L., 133, 195.
Quesenberry, G. R., 695.
Quesenberry, J. R., 271.
Quinby, J. R., 500.
Quinlan, L. R., 197.
Quinn, J. T., 431, 437, 444, 446.
Quisenberry, K. S., 31, 338, 600.
Qvist, W., 506.

Rabaud, E., 56.
Ragsdale, A. C., 473, 479.
Ramakrishna Aiyar, T. V., 861.
Ramasubramanian, T. S., 617.
Ramos, R. M., 133, 147, 195, 249.
Ramsay, J. M., 94, 592.
Ramsay, W. G., 210.
Ramsey, G. B., 849.
Ramsower, H. C., 571.
Ranade, S. B., 638.
Randoin, L., 265.
Randolph, J. W., 683.
Rankin, J. O., 189.
Ransom, B. H., 552.
Ransom, W. L., 493.
Rao, K. A., 16.
Rao, K. S., 530.
Rao, M. A. N., 863.
Rao, M. K. V., 152.

Rask, O. S., 410, 807.
Rasmussen, L., 695.
Rasmussen, M. P., 704.
Rassfeld, L., 678.
Rassieur, T. E., 393.
Rathbun-Gravatt, A., 356.
Rau, M. A. N., 786.
Rauchenstein, E., 489.
Ravenna, C., 826.
Ray, C. L., 210, 719.
Rea, H. E., 500.
Rea, J. L., jr., 775.
Read, J. W., 781.
Reader, V. B., 863.
Recknagel, A. B., 345.
Record, S. J., 644.
Records, E., 478.
Rector, T. M., 208.
Reddick, D., 852.
Reddy, C. S., 849.
Redewill, F. H., 783.
Reed, C. A., 538.
Reed, C. D., 718.
Reed, C. O., 400.
Reed, G. M., 349, 751.
Reed, H. E., 465.
Reed, H. J., 194, 419, 431, 497.
Reed, O. E., 379, 780.
Rees, W., 393.
Reeve, (Mrs.) A. H., 95.
Reeve, L. P., 199.
Reeves, G. I., 380.
Regan, W. M., 175
Régnier, R., 551.
Reichelderfer, F. W., 719.
Reid, E. E., 309.
Reid, F. R., 521.
Reid, W. H. E., 76, 77.
Reinhard, E. G., 656.
Reinking, O. A., 747.
Reitch, T. C., 500.
Rentfrow, B. W., 179.
Rettger, L. F., 80.
Rew, H., 100, 390.
Reyne, A., 859.
Reynolds, A., 396.
Reynolds, A. E., 691.
Reynolds, F. E., 397.
Reynoldson, L. A., 190.
Rhoads, A. S., 354.
Rice, F. O., 309.
Rice, J. L., 580.
Rich, E. M., 222.
Richards, C. A., 356.
Richards, G., 621.
Richards, H. I., 595, 687.
Richards, H. M., 144.
Richards, P. B., 554.
Richardson, A., 208.
Richardson, A. E., 800.
Richardson, A. H., 41.
Richardson, A. L., 702, 703.
Richardson, A. W., 278.
Richardson, B. T., 298.
Richardson, C. H., 253.
Richardson, F. B., 35, 37, 239.
Richardson, H. G., 387.
Richey, F. D., 32, 830.
Richmond, H. D., 808.
Richmond, R. G., 160.
Richter, 45, 46.
Rickey, R., 525.
Ricôme, H., 623, 727.
Riddle, O., 672, 733, 834.
Ries, H., 587.
Riesch, A. von V. von, 652.
Rietti, C. T., 562.
Riggs, A. G., 767.
Riggs, W. M., 597.
Riker, A. J., 443, 645.
Riley, H. W., 697.
Rimington, C., 205.
Ringelmann, M., 85, 286.
Ripley, L. B., 55, 256.
Rippel, A., 511.
Ritchie, M. I. F., 370.
Ritter, G. J., 110.
Ritter, L., 235.
Rives, L., 250, 354.
Rivoire, P., 845.
Robbiani, A., 270.
Robbins, F. S. R., 867.
Robbins, W. J., 123, 442.
Roberts, E., 571.
Roberts, J., 167.
Roberts, J. A. F., 228.
Roberts, O. S., 724.
Roberts, R. H., 438, 843.
Robertson, C. L., 317, 412.
Robertson, D. A., 597.
Robertson, D. L., 833.
Robertson, D. W., 128.
Robertson, L. L., 526.
Robertson, R., 408.
Robertson, W. A. N., 181.
Robinson, G. W., 10, 503, 815.
Robinson, H. H., 697.
Robinson, J. H., 71.
Robinson, J. L., 435.
Robison, W. L., 470, 870.
Robotka, F., 94.
Robscheit-Robbins, F. S., 867.
Robson, W., 569.
Rockwell, E. H., 598.
Rockwell, G. E., 609.
Rockwood, R., 286.
Roderick, L. M., 600.
Rodillon, G., 715.
Rodolfo, A., 428.
Roehl, L. M., 186.
Roger, H., 367.
Rogers, L. A., 174.
Rogers, T. C., 98.
Rogers, W. E., 328.
Rohr, F. J., 592.
Rohwer, S. A., 656, 861.
Rollins, H. A., 487, 687.
Rosa, J. T., 532, 534, 635, 636.
Rose, A. C., 683.
Rose, A. R., 59.
Rose, D. H., 549.
Rosenfeld, A. H., 133.
Rosewall, O. W., 157.
Ross, A. B., 40.
Ross, H. A., 690.
Ross, H. E., 607.
Ross, W. A., 358.
Rougebief, H., 182.
Round, G. A., 485.
Rowe, A. W., 365.
Rowlands, W. A., 84.
Roxas, M. L., 207.
Roy, E., 358.
Royer, K. M., 475.
Rubner, M., 68, 769.
Rude, C. S., 57.
Rudolfs, W., 828.
Rudy, R. B., 714.
Ruehle, G. L. A., 25, 781.
Rugg, W. C., 374.
Ruhland, W., 699.
Ruhmann, M. H., 155, 253.
Rumbold, C., 248.
Rummell, L. L., 383.
Runk, C. R., 323.
Russel, J. C., 318, 511, 815.
Russell, E. Z., 873.
Russell, H. L., 199, 400, 497, 693, 800.
Russell, J., 801.
Russell, P. F., 559.
Russell, W. C., 98, 900.
Rust, E. W., 856.
Ruston, A. G., 688.
Ruth, W. A., 549.
Rutherford, J. G., 868.
Růžička, V., 100.

Saccá, R. A., 46.
Sachs, W. H., 435.
Sack, J., 123.
Sackett, R. L., 598.
Sackett, W. G., 117, 146.
Sackville, J. P., 67, 68, 668.
Sadtler, S. S., 503.
Saillard, E., 532.
St. George, R. A., 557.
St. John, C., 786.
Ste. Marie, J. A., 674, 869, 872, 873, 874.
Saito, S., 831.
Sajous, P., 562.
Salaman, R. N., 43, 248.
Salisbury, S. M., 473.
Salmon, S. C., 531.
Salmon, W. D., 167, 570.
Salter, R. M., 698, 719.
Samet, J., 63.
Sammis, J. L., 474.
Samuels, L. T., 210.
Sanborn, N. W., 274.

Sanctuary, C. T., 260.
Sand, 130.
Sand, A. W. W., 644.
Sandberg, E., 581.
Sanders, D. A., 399.
Sanders, J. G., 452.
Sanders, J. T., 90.
Sanders, M. B., 699.
Sanders, W. A., 196.
Sanderson, D., 897.
Sando, W. J., 425.
Sandon, H., 98.
Sands, W. N., 148.
Sandsten, E. P., 143.
Sanmann, F. P., 176.
Santini, C., 390.
Sarvis, J. T., 132, 168, 528, 574.
Sato, S., 81.
Saunders, A. D., 60.
Sauve, E. C., 392.
Savage, C. G., 643, 841.
Savastano, L., 50.
Saville, T., 587.
Sax, K., 342, 740, 742.
Sayer, W., 631.
Sayre, C. B., 543, 544.
Scarborough, D. D., 290.
Schaede, R., 521.
Schaefer, E., 532.
Schaefer, H., 634.
Schaefer, O. G., 76.
Schaffner, J. H., 524.
Schander, 45, 46, 246.
Scharrer, K., 611.
Schaub, I. O., 800.
Scheff, G., 205.
Schepmann, W., 812.
Scherago, M., 786.
Scherffius, W. H., 736.
Schertz, F. M., 313, 501.
Scheunert, A., 269, 566, 764.
Schieblich, M., 566.
Schkaff, E., 192.
Schlag, H., 203.
Schlesinger, M. J., 367.
Schlatty, P., 580.
Schlich, W., 42.
Schlingman, A. S., 181.
Schlömer, F., 297.
Schmidt, C. R., 495.
Schmidt, D., 23, 432.
Schmidt, E. W., 25, 148.
Schmoe, F. W., 744.
Schneiderhan, F. J., 40.
Schneidermann, K., 891.
Schoenfeld, A. F., 885.
Schoening, H. W., 583, 670.
Schoffstall, C. W., 737.
Schopmeyer, C. H., 495.
Schoth, H. A., 638.
Schott, F. M., 652.
Schotte, G., 800.
Schotz, S. P., 204.
Schøyen, T. H., 755.
Schrader, A. L., 240.
Schrader, C. C., 188.
Schreiber, H., 114.
Schroeder, E. C., 383, 480.
Schubert, A. A., 689.
Schulte, J. I., 696.
Schultz, E. S., 45, 544, 646.
Schultz, W., 526.
Schultze, W., 759.
Schulz, E. R., 107, 327.
Schumaker, D., 697.
Schuster, C. E., 642.
Schuster, E. H. J., 764.
Schwalen, H. C., 780.
Schwartz, B., 586, 760, 855.
Schweizer, J., 759.
Schweizer, K., 202.
Scoates, D., 400.
Scofield, F. W., 279.
Scott, D. A., 804.
Scott, H. H., 50.
Scott, I. T., 442.
Scott, J. E., 846.
Scott, J. P., 884.
Scott, J. W., 564.
Scott, R. C., 120.
Scott, W. L. (England), 683.
Scott, W. L. (India), 31.
Searle, G. O., 522.
Sears, O. H., 326.
Seaton, M. A., 472.
Seaton, R. A., 598, 800.
Seaver, F. J., 858.
Seckinger, D. L., 526.
Secrest, E., 599.
Seddon, H. R., 886.
Seely, F. B., 684.
Segelin, H. E., 499.
Seiff, R., 291.
Seifriz, W., 124.
Seignolle, P., 192.
Seiler, J., 98.
Sein, F., jr., 147, 156.
Selby, H. E., 136, 499, 793.
Selvig, C. G., 113, 119, 130, *139*, *149*, *150*, *169*, *170*, 194.
Semple, A. T., 466.
Sendstad, O., 796.
Sensintaffar, L., 490.
Sergent, E., 182.
Sering, M., 291, 296.
Severns, W. H., 389.
Sewell, M. C., 791.
Seymour, V. H., 270.
Seyrig, A., 57.
Shamel, A. D., 643.
Shanklin, S. M., 846.
Sharif, M., 260.
Sharp, P. F., 311, 802.
Shaw, H. B., 702.
Shaw, R. S., 398, 798.
Shaw, W. M., 320, 517.
Shaw, W. S., 610.
Shaw, W. T., 50, 251, 756.
Shear, C. L., 544, 550.
Shedd, O. M., 739.
Sheehy, E. J., 275.
Sheely, A. L., 196.
Sheets, E. W., 770.
Shenehon, F. C., 704.
Shepherd, A. N., 588.
Sherbakoff, C. D., 47, 747.
Sherborn, C. D., 551.
Sherman, C. W., 890.
Sherman, F., 755.
Sherman, H. C., 63, 106, 161, 408, 562.
Sherman, J. M., 676.
Sherrard, E. C., 610.
Sherwin, C. P., 59.
Sherwood, F. F., 105, 782.
Sherwood, F. W., 775.
Shillinger, J. E., 385, 584, 585.
Shim, E., 619.
Shinn, C. H., 243.
Shiple, G. J., 59.
Shipley, A. E., 761.
Shirras, G. F., 89.
Sholes, F. N., 130.
Shollenberger, J. H., 9, 238.
Shorter, S. A., 531.
Shortt, H. E., 552.
Shoults, W. A., 580.
Shoup, G. R., 288.
Shrader, J. H., 581.
Shreve, F., 19, 517, 823.
Shuey, P. McG., 804.
Shull, A. F., 524.
Shutt, D. B., 798.
Shutt, F. T., 135, 137, 138, 237.
Sibley, F. H., 598.
Sideris, C. P., 342, 828.
Siegler, E. H., 452.
Sievers, F. J., 216.
Siler, J. F., 654.
Silsbee, C. G., 613, 810.
Silva Barrios, F. A., 474.
Silverman, D. N., 457.
Silvestri, F., 156.
Simmonds, N., 660, 766, 767.
Simmons, P., 454, 758.
Simon, R. H., 787.
Simonnet, H., 166, 265.
Simpson, D. M., 336.
Sinclair, C. G., 360.
Sinclair, R. D., 68, 668.
Singh, K., 168.
Singh, S. D., 632.
Sisson, S., 77.
Sitowski, L., 58.
Sjogren, O. W., 86.
Skinner, C. E., 98.
Skinner, J. H., 465, 800.
Skinner, J. J., 218, 521, 538.
Slate, W. L., jr., 299, 496, 737, 751, 800, 887.
Slater, F. P., 634.
Sloane, T. O'C., 686.
Slocum, B. A., 860.
Slonaker, J. R., 428, 832, 833.
Smales, C. B., 146.
Small, C. P., 694.

Small, W., 147.
Smart, W. A. M., 364.
Smith, A. H., 711.
Smith, A. M., 417.
Smith, B. B., 592, 813.
Smith, C., 711.
Smith, C. B., 598.
Smith, C. M., 110.
Smith, C. R., 807.
Smith, C. W., 400.
Smith, E. B., 790.
Smith, E. H., 354.
Smith, E. J., 580.
Smith, E. L., 693.
Smith, E. R., 806.
Smith, E. W., 188.
Smith, G. D., 196.
Smith, G. E. P., 281, 789.
Smith, G. H., 581.
Smith, H., 43.
Smith, H. A., 297, 740.
Smith, H. D., 361.
Smith, H. H., 67, 264.
Smith, H. S., 357.
Smith, J. B., 420, 465.
Smith, L. H., 720, 723.
Smith, L. J., 288.
Smith, M., 764.
Smith, M. E., 99.
Smith, R. E., 354.
Smith, R. G., 697.
Smith, R. H., 197.
Smith, R. O. A., 860.
Smith, R. P., 206.
Smith, R. S., 17, 720.
Smith, S. C., 732.
Smith, T., 182, 785, 885, 887, 889.
Smith, W. G., 515.
Smith, W. H. 599.
Smythies, E. A., 42.
Snapp, R. R., 599.
Snell, M. G., 369.
Snodgrass, K., 594, 796.
Snodgrass, R. E., 158, 655.
Snow, S. J., 454.
Snyder, C. E., 78, 571.
Snyder, E., 309.
Snyder, E. F., 714.
Snyder, H., 715, 807.
Snyder, J. M., 417.
Snyder, L. H., 430.
Snyder, R. M., 726.
Snyder, T. E., 856.
Snyder, W. H., 693.
Soames, K. M., 265.
Sobernheim, G., 78.
Söderbaum, H. G., 121.
Söhngen, N. L., 123.
Sokoloff, B., 100.
Sokolov, N. P., 791.
Sokolowska, Z., 172.
Solley, R., 165.
Somayajulu, C. R., 868.
Sommer, H., 634.
Sommer, H. H., 408, 411, 475.
Soper, F. L., 787.
Sopp, E., 162.
Soppeland, L., 86.
Sordelli, A., 562.
Sordina, J., 157.
Sorensen, S. P. L., 261.
Sorenson, C. J., 799.
Soule, A. M., 363, 800.
Soule, R. M., 212.
South, F. W., 153.
Southgate, H. W., 204.
Southwell, T., 761.
Sparhawk, W. N., 540.
Spaulding, P., 651.
Spears, H. D., 269.
Spencer, G. C., 806.
Spencer, H., 499.
Spencer, J. B., 868.
Spencer, R. R., 58.
Spicer, C. W. J., 683.
Spiegl, A., 888.
Spillman, W. J., 289, 290.
Spindler, H., 881.
Spinks, G. T., 641.
Spoehr, H. A., 15, 26, 821, 822.
Spokes, P. S., 213.
Spragg, F. A., 798.
Spurway, C. H., 515.
Sreenivasaya, M., 858.
Ssawron, E., 165.
Stadler, L. J., 60, 235, 431.
Stafseth, H. J., 787.
Stahl, J. L., 843.
Staidl, J. A., 356.
Staker, E. V., 135.
Stakman, E. C., 847, 848.
Stammers, A. D., 385.
Stange, C. H., 78.
Staugel, W. L., 198.
Stanlland, L. N., 255.
Stanley, E. B., 769, 773.
Stanley, L., 496, 597, 598.
Stanton, A. T., 678.
Stanton, T. R., 349, 830.
Stapledon, R. G., 336.
Starin, W. A., 784.
Starkey, L. V., 68, 272.
Starring, C. C., 742.
Stearns, L. A., 53, 360, 755.
Steenbock, H., 9, 264, 379, 463, 464, 568, 805, 870.
Stegmann, F. P., 67.
Stehlík, V., 24.
Steidle, H., 62.
Steinbrech, J. M., 536.
Stellwaag, F., 348, 652, 700.
Stene, A. E., 499.
Stent, S. M., 231.
Stephens, J. M., 113, 195, 599.
Sterling, W. F., 805.
Steuart, D. W., 167, 505.
Steve, N. D., 697.
Stévenin, H., 458.
Stevens, F. L., 355.
Stevens, G. C., 83.
Stevens, H. B., 380.
Stevens, O. A., 237.
Stevenson, A. E., 208, 457.
Stevenson, H. A., 697.
Stevenson, W. H., 402, 403, 420, 510, 798.
Stewart, B., 593.
Stewart, C., 813.
Stewart, C. L., 289, 488.
Stewart, C. P., 762.
Stewart, G., 699.
Stewart, G. R., 100.
Stewart, H. R., 632.
Stewart, H. W., 415.
Stewart, J. T., 588.
Stewart, S., 514.
Stiles, C. W., 855.
Stillman, H. A., 457, 462, 768.
Stine, C. M., 309.
Stine, O. C., 92, 289.
Stoa, T. E., 34, 232.
Stockman, S., 380, 583.
Stoddard, E. M., 450.
Stoddard, H. L., 252.
Stoffel, H., 270.
Stokdyk, E. A., 628.
Stoklasa, J., 700, 828.
Stoletova, E. A., 36.
Stomps, T. J., 126.
Stone, J. H., 684.
Storey, H. H., 47, 546.
Stout, A. B., 144, 340, 342, 344, 538, 838.
Strachan, J., 675.
Straight, E. M., 340, 840.
Stratton, L. M., 899.
Straub, E. L., 279.
Strauch, T. J., 580.
Strausbaugh, P. D., 125.
Streeter, G. L., 525.
Stroman, G. N., 229, 500.
Strong, H. M., 295, 491.
Strong, R. L., 188.
Strouse, S., 60.
Strowd, W. H., 666.
Stuart, G., 678.
Stuart, W., 635.
Stubbs, E. L., 786.
Stubbs, W. C., 240.
Stuckey, H. P., 299.
Sturges, A. M., 56.
Sturlaugson, V. V., 600.
Sugawara, M., 19.
Sugimoto, S., 831.
Suhm, C. F., 810.
Sullivan, B., 715, 807.
Sullivan, K. C., 450, 451.
Sultan Ali, M., 632.
Summerby, R., 527.
Summers, C. E., 483.
Summers, F., 137.
Sumner, F. B., 428.
Sumner, H. R., 528.
Sundararaman, S., 49.
Supplee, G. C., 565, 580, *659.

Sure, B., 62, 565, 657.
Sutton, G. L., 214.
Svenson, H. K., 428.
Sverdrup, A., 331.
Svirenko, V. O., 881.
Swain, G. F., 284.
Swaine, J. M., 557, 559.
Swainson-Hall, R., 350.
Swaminath, C. S., 552.
Swanson, C. O., 531, 534.
Swartwout, H. G., 241, 436, 447.
Swenehart, J., 84, 400.
Swezey, O. H., 653, 654, 857.
Swierstra, J. S., 270.
Swift, R. W., 274.
Swingle, C. F., 641, 843.
Swingle, W. W., 524.
Sylvén, N., 633, 644.
Symes, C. B., 53.
Szegloff, O., 518.
Szymkiewicz, D., 15.
Szymoniak, B., 536.

Taggart, J. G., 340.
Taguchi, K., 81.
Tague, E. L., 803.
Tait, W. C., 552.
Takahashi, K., 660.
Takahashi, N., 830.
Takahashi, R., 157.
Takamine, N., 423.
Talbert, T. J., 436.
Taleon, A. T., 577.
Talmage, H. R., 635.
Tamachi, I., 117.
Tan, J. P., 359.
Tanner, F. W., 276.
Tanner, W. F., 662.
Tanner, W. L., 812.
Tapke, V. F., 647.
Tapp, J. W., 95.
Tattersfield, F., 556.
Taubenhaus, J. J., 647.
Tavares, H. A., 44.
Tawney, R. H., 93.
Taylor, A. E., 594, 796.
Taylor, A. G., 672.
Taylor, C. C., 898.
Taylor, E. A., 198.
Taylor, E. McK., 115, 318, 513.
Taylor, F. W., 432.
Taylor, G. B., 581.
Taylor, H. C., 95, 499, 694, 795.
Taylor, J., 600.
Taylor, J. C., 99.
Taylor, J. W., 134, 646.
Taylor, M. W., 651.
Taylor, R. H., 344.
Taylor, T. S., 684.
Taylor, W. P., 825.
Tazelaar, M., 284.
Teakle, L. J. H., 215.
Tear, F. J., 846.
Teipel, H., 80.
Tempest, J. S., 280.
Templeton, J., 234.
Tengwall, T. A., 237, 509.
Tenny, F. G., 98.
Tenny, L. S., 598.
Teodorescu, I. C., 344.
Terao, H., 831.
Terlikowski, F., 320.
Terni, C., 270.
Ternovskii, M., 138.
Terrell, W. G., 269.
Terroine, E. F., 827, 881.
Thadani, K. I., 331.
Thatcher, L. E., 17, 599, 698, 737.
Thatcher, R. W., 598, 601, 603, 606, 707, 710, 806.
Theobald, F. V., 255, 554.
Theron, J. J., 616.
Thiel, P. H. van, 482.
Thom, C., 59, 522.
Thomas, A. W., 106.
Thomas, C. A., 455.
Thomas, E., 302.
Thomas, F. L., 57.
Thomas, H. H., 640.
Thomas, J. M., 98, 900.
Thomas, M. D., 483.
Thomas, R. C., 543.
Thomas, W., 108.
Thompson, A., 148, 695.
Thompson, D. H., 426.
Thompson, G. E., 419, 433, 733.
Thompson, H. C., 339.
Thompson, H. N., 43.
Thompson, H. W., 584.
Thompson, J. G., 897.
Thompson, J. W., 462.
Thompson, M. J., 278.
Thompson, N. F., 327, 748.
Thompson, R. J., 208.
Thompson, W. H., 196.
Thompson, W. O., 705.
Thompson, W. R., 55, 159.
Thomsen, L. C., 475, 487.
Thomson, A., 719.
Thornber, J. J., 798.
Thorne, C. E., 39, 217, 698, 735, 797.
Thornton, H. G., 232.
Thornton, T., 885.
Thorpe, M. R., 27.
Thümmel, T., 160.
Thurston, F. M., 697.
Thurston, H. W., jr., 48.
Thysell, J.C., 132, 528.
Tilford, P.E., 46.
Tims, E. C., 849.
Tisdale, W. B., 196.
Tisdale, W. H., 646.
Tissot, A. N., 196.
Tittsler, R. P., 786.
Titus, C. M., 476.
Titus, R. W., 877.
Tjaglin, A. F., 621.
Tjebbes, K., 228.
Tobriner, M. O., 392.
Todd, J. A., 898.
Toens, P., 781.
Tokuda, Y., 160.
Tolaas, A. G., 635.
Tolland, A. R., 580.
Tolle, R. E., 97.
Tolley, H. R., 95.
Tom, R. B., 698.
Tormey, J. L., 571.
Toro, R. A., 250.
Torp, B., 598.
Torre, P. de la, 137.
Tostlebe, A. S., 291.
Toumey, J. W., 539.
Tourniéroux, J. A., 272.
Townsend, J. S., 234.
Trabut, 729.
Tracy, P. H., 883.
Trajkovich, B., 18.
Traum, J., 78, 180.
Treherne, R. C., 254, 256, 750.
Trelease, W., 745.
Trench, A. D. le P., 152, 844.
Tretsven, J. O., 771.
Trevor, C. G., 42.
Trimble, F. M., 259.
Trimble, H. E., 557.
Tripp, F. V., 316, 508.
Trost, J. F., 247.
Trouvelot, B., 653.
Trowbridge, E. A., 464, 466, 470, 494.
Truax, C. V., 498.
True, A. C., 95, 289, 404, 597, 705.
True, G. H., 571.
Truesdell, L. E., 591.
Truffaut, G., 20, 117, 826.
Trullinger, R. W., 400, 589, 686.
Truog, E., 416.
Tryon, H., 257.
Tschajanow, A., 297.
Tscherkes, L. A., 61.
Tso, E., 459, 561.
Tuason, N. A., 374.
Tubeuf, K. von, 728.
Tuck, C. H., 493.
Tucker, C. M., 549.
Tucker, R. W. E., 657.
Tuckwiller, R. H., 770.
Tuff, P., 269.
Tufts, W. P., 37, 439.
Tugwell, R. G., 891.
Tukada, 831.
Tunnicliff, E. A., 786.
Turley, H. E., 109.
Turnbow, G. D., 476.
Turnbull, G., 673.
Turner, C. W., 86.
Turner, E. L., 252.
Turner, J. D., 269.
Turner, N., 451.
Tutt, E. L., 298.

Udall, D. H., 182, 680.
Ufford, O. C., 487.
Úlehla, V., 423.
Ungerer, E., 275.
Upham, C. M., 83.
Urquhart, A. R., 531.
Urquhart, J. C., 502.

Vacha, N. K., 479.
Vagliano, M., 367.
Valensin, G., 596.
Valgren, V. N., 595.
Valmari, J., 118.
Van Arsdale, M. B., 363.
van Bemmelen, J. M., 802
Van Brunt, C., 590.
Van Buskirk, E. F., 603.
van Damme, C., 270.
Van Deman, R., 260, 290.
van der Merwe, C. P., 358.
van der Merwe, C. R., 616.
van der Plank, G. M., 269.
Vandervort, J., 71.
Vanderyst, H., 839.
van der Zyl, C. E., 509.
Van Dusen, M. S., 684.
Van Duzer, A. L., 398.
Van Dyke, E. C., 856.
Van Es, L., 78, 179, 384.
Van Fleet, V. W., 532.
van Heelsbergen, T., 785.
Van Rensselaer, M., 800.
Van Rossem, A., 812.
Van Saceghem, R., 888.
van Thiel, P. H., 482.
van Welderen, E., 269.
Varney, B. M., 210, 509, 718, 719.
Vas, K., 277.
Vaslin, P., 883.
Vaughan, R. E., 443.
Vavilov, N. I., 138.
Vawter, L. R., 478.
Vayssière, P., 361.
Veenbaas, A. H., 270.
Veitch, W., 697.
Velu, H., 678, 786, 884.
Venables, E. P., 260, 859.
Venkata Rao, M. K., 152.
Verge, J., 81.
Verkhovskii, I. M., 620.
Vermoesen, C., 644.
Vernon, H. M., 764.
Vernon, J. J., 595.
Veve, R. A., 352, 649.
Vial, J. M., 571.
Viala, P., 354.
Viana, L., 357.
Vicente, E., 517.
Vickery, H. B., 105, 712.
Vidal, R., 332.
Vietinghoff von Riesch, A. von, 652.
Villedieu, G., 545.
Villedieu, (Mrs.) G., 545.
Vinal, G. W., 187.
Vinson, A. E., 418, 769, 789.
Violle, H., 279.
Virtanen, A. I., 474.
Visher, S. S., 813.
Vodrážka, O., 423
Voegtlin, C., 462.
Vogel, 270.
Vogt, E., 43.
Von Ostertag, 270.
Voorhees, J. F., 210.
Voorhies, E. C., 498.
Vorhies, C. T., 754, 825.
Voronoff, S., 167.
Vos, J., 270.
Voskressensky, A., 422.
Voss, G. E., 878.
Votey, J. W., 598.
Voukassovitch, P., 656, 760.
Vuillemin, P., 626.

Waardenburg, P. J., 629.
Wada, U., 831.
Waddell, R. L., 571.
Waddington, H., 677.
Wagner, K., 100.
Wagner, R., 107, 601.
Wahlenberg, W. G., 345, 540.
Waite, R. H., 877.
Waite, W. C., 294.
Waite, W. H., 242.
Wakefield, E. M., 550.
Waksman, S. A., 215, 310, 818.
Walden, B. H., 450.
Waldo, G. F., 743.
Waldron, R. A., 236.
Wales, R. L., 598.
Walker, A. L., 98, 878, 892.
Walker, B. M., 197.
Walker, G. T., 719.
Walker, H., 761.
Walker, H. B., 400.
Walker, J. C., 348, 351, 443, 849.
Walker, J. E., 609.
Walker, L. S., 22.
Walker, L. V., 694.
Wallace, H. A., 289.
Wallace, H. C., 289, 594, 597.
Wallace, L., 399.
Wallace, Q. W., 570, 776.
Wallace, U., 677.
Waller, A. G., 98, 135.
Waller, E., 882.
Waller, J. C., 222.
Wallis, A. H., 413.
Wallis, E. S., 105.
Walter, A., 576.
Walter, E. J., 99.
Walther, E., 861.
Walton, C. F., jr., 716.
Walton, C. L., 52, 758.
Walton, R. C., 48, 649.
Walton, T. O., 500, 800.
Walts, C. C., 109, 315, 808, 809.
Wang, C. C., 66.
Wang, G. H., 573.
Wangler, J. G., 712.
Wankler, W., 860.
Warburton, C., 253.
Warburton, C. W., 598.
Ward, A. R., 580.
Ward, J. M., 257.
Wardall, R. A., 800.
Ware, F., 680.
Ware, W. M., 233.
Waring, J. H., 439.
Warington, K., 26.
Warnants, F., 270.
Warneford, F. H. S., 717.
Warren, A. H., 506.
Warren, D. C., 427.
Warren, G. F., 493, 795.
Warringsholz, 678.
Warwick, B. L., 478, 479, 885.
Washburn, F. L., 551.
Waters, H. J., 705.
Waters, N. F., 198.
Watson, A. H., 97.
Watson, E. A., 382.
Watson, E. B., 16.
Watson, E. R., 200, 811.
Watson, J. R., 52, 757, 856.
Watson, T. L., 587.
Watts, R. L., 595, 800.
Weaver, E., 390.
Weaver, F. P., 600.
Weaver, J. E., 17, 824, 825.
Weaver, L. A., 70, 464, 469, 575.
Webb, F. N., 270.
Webb, R. W., 349, 848, 851.
Wehber, H. J., 498.
Weber, C. W., 383.
Weber, F., 25.
Weber, G. F., 649.
Webster, R. L., 652, 857.
Wedgwood, Harriet, 95.
Wedgwood, Hazel, 95.
Weed, C. M., 756.
Weeks, D., 399.
Weeks, J. W., 145.
Wehrwein, G. S., 100, 289, 689.
Weigel, C. A., 357.
Weil, 827.
Weinstock, M., 568, 767.
Weis, A., 699.
Weiser, I., 268.
Weiss, H., 368.
Weiss, H. B., 253, 363.
Weisse, A., 424.
Weitzman, I., 886.
Welch, H., 279.
Welch, W. H., 178.
Weld, L. D. H., 493.
Welker, W. H., 458.
Weller, E. P., 798.

Wellman, F. L., 443.
Wells, C. F., 780.
Wells, H. M., 448.
Wells, H. S., 278, 585.
Welton, A. D., 289.
Welton, F. A., 698.
Wendelmuth, G., 209.
Weniger, W., 600, 749, 852.
Wentworth, E. N., 571.
Wentworth, S. W., 437.
Werchowsky, E., 620.
Werkman, C. H., 381.
Werner, G., 790.
Werner, H. O., 445, 635.
Wesselow, O. I. V. de, 411.
West, E., 363.
Westbrook, E. C., 238.
Wester, P. J., 137, 835.
Weston, J. W., 339, 798.
Weston, W. H., jr., 542.
Wharton, M. F., 890
Wheeler, E. H., 413, 719.
Wheeler, G. A., 662.
Wheeler, L. A., 295, 296.
Wheeler, S. S., 199, 600.
Wheeting, L. C., 419, 820.
Whetzel, H. H., 347, 355, 852.
Whipple, B. K., 496.
Whipple, G. H., 867.
Whitcomb, E. S., 95, 397.
Whitcomb, W. D., 452.
White, A. C., 569.
White, A. H., 590, 676.
White, G. C., 80.
White, J. D., 592.
White, J. W., 714.
White, L. T. W., 52.
White, P. S., 577.
Whitehead, T., 43, 245.
Whitehorn, J. C., 12.
Whiting, A. R., 525.
Whitson, A. R., 415, 621.
Whittaker, E., 569.
Whittles, C. L., 117.
Whittlesey, D. S., 694.
Whitworth, S. H., 582.
Wibbens, H., 269.
Wibeck, E., 126.
Widell, L., 898.
Widmark, E., 660.
Wiegand, E. H., 810.
Wiegner, G., 269.
Wieland, G. R., 27.
Wiener, W. T., 835.
Wiepking, C. A., 185.
Wiessmann, H., 418.
Wigder, C. F., 100, 889.
Wigglesworth, A., 530.
Wilbrink, G., 352.
Wilbur, J. W., 175, 176.
Wilde, H. D., jr., 106, 805.
Wilder, R. M., 368.
Wildermuth, R., 814.
Wilford, E. J., 571.
Wilkins, F. [illegible], 636.
Wilkinson, J. A., 617.
Willaman, J. J., 143.
Willard, C. J., 339, 599.
Willard, J. D., 800.
Willard, R. E., 95.
Willard, R. K., 694.
Williams, A. M., 312, 531.
Williams, A. P., 396, 495.
Williams, C. B., 112, 115, 317. 755, 850.
Williams, C. G., 599, 899.
Williams, H., 166.
Williams, H. (England), 188.
Williams, J. M., 692.
Williams, O. B., 215.
Williams, P. H., 640.
Williams, R. D., 836.
Williams, R. H., 198, 769, 773.
Williams, R. R., 204, 765.
Williams, R. S., 380.
Williams, R. W., 598.
Williams, V. M., 176, 770.
Williams, W. L., 182.
Willier, J. G., 32.
Willis, H. P., 590.
Willis, J. A., 254.
Willis, J. C., 126, 225.
Willis, M. A., 836.
Willis, R. L., 37.
Willis, S., 33.
Willits, F. P., 498.
Willson, C. A., 800.
Willson, E. A., 600.
Wilsdon, B. H., 817.
Wilson, A. W. G., 220.
Wilson, B. D., 642.
Wilson, C. C., 745.
Wilson, E. B., 829.
Wilson, E. H., 539.
Wilson, F. C., 386.
Wilson, G. F., 49, 254, 257.
Wilson, H. D., 666.
Wilson, H. E. C., 762.
Wilson, H. F., 259.
Wilson, I. T., 28.
Wilson, J., 689.
Wilson, M., 542.
Wilson, M. C., 95.
Wilson, M. L., 685, 897.
Wilson, R., 145, 540.
Wilson, W. H., 797.
Wilson, W. M., 197.
Wimberger, H., 661.
Wimer, D. C., 32.
Wimmer, G., 235.
Winchell, C. M., 95, 598.
Windes, E. E., 495.
Windheuser, C., 672.
Window, J. J., 294.
Wineland, G. O., 747, 850.
Wines, W. E., 165.
Wing, C. C., 580.
Winge, Ö., 426, 731.
Winkel, A. J., 181.
Winkler, A. J., 744.
Winston, J. R., 254, 855.
Winter, A. R., 571.
Winter, F. L., 233.
Winters, L. M., 267.
Winters, R. Y., 198, 734, 736.
Wirt, F. A., 400.
Wisler, C. O., 580.
Withey, M. O., 185.
Withycombe, R., 894.
Witte, H., 336.
Witte, J., 81.
Woglum, R. S., 255.
Woker, G., 8.
Wolbach, S. B., 552.
Wolcott, G. N., 51, 155.
Wolf, F. A., 746, 754.
Wolfe, H., 32.
Wolff, J., 726.
Wolkoff, M. I., 11.
Wollenweber, H. W., 747.
Wolpert, F. S., 224.
Wong, L. N., 857.
Wood, A. J., 684.
Wood, I. D., 86.
Wood, L. A., 895.
Wood, T. B., 1[illegible], 377, 667.
Woodbury, C. G., 498.
Woodcock, E. F., 783.
Woodman, H. E., 373, 503, *667.*
Woodman, R. M., 556.
Woodruff, L. L., 27.
Woods, A. F., 598, 702.
Woods, P. T., 274.
Woodworth, C. M., 349.
Woolard, E. W., 508.
Wooley, J. C., 287, 482.
Woolley, H. T., 95.
Woolman, H. M., 647.
Wooton, E. O., 88.
Work, P., 407.
Working, E. B., 421, 822.
Works, G. A., 800.
Woroniecka, J., 857, 860.
Worthen, E. L., 119.
Wozak, J., 270.
Wriedt, C., 369, 729.
Wright, C. H., 335.
Wright, L. H., 586.
Wright, S., 571.
Wright, W. J., 897.
Wuichet, J. W., 571.
Wunn, H., 652.
Wurmser, R., 827.
Wymore, F. H., 58.

Yagloglou, C. P., 161.
Yamagata, U., 25.
Yamane, J., 630.
Yapp, W. W., 571.
Yates, W. W., 62.
Yeager, A. F., 239, 342.
Yee, M. A., 503.
Yerkes, A. P., 399.

Yetter, W. P., jr., 154.
Yoder, P. A., 23.
Yothers, W. W., 254, 653, 856.
Young, H. C., 847.
Young, J. B., 321, 517.
Young, W. J., 810.
Youngblood, B., 598, 599, 667, 707, 800.
Yule, G. U., 225.
Zacharewicz, E., 517.
Zaĭtsev, G. S., 36, 129, 136.
Zakharova, T. M., 512.
Zander, E., 860, 861.
Zanen, J. P., 270.
Zappe, M. P., 450.
Zeman, Z., 270.
Zerban, F. W., 110.
Zhukovskiĭ, P. M., 35.
Zielstorff, W., 377.
Zillig, 44.
Zilva, S. S., 377.
Zimmerley, H. H., 640.
Zimmerman, H. J., 203.
Zimmerman, O. B., 187.
Zon, R., 100, 400.
Zundel, G. L., 151.
Zunker, F., 386.
Zyl, C. E. van der, 509.

98715—26——4

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.," "Conn.State," "Mass.," etc., after entries refer to the publications of the respective State experiment stations; "Alaska," "Guam," "Hawaii," "P.R.," and "V.I." to those of the experiment stations in Alaska, Guam, Hawaii, Porto Rico, and Virgin Islands; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

Abaca, international trade, 296.
Abortion—
- control, Minn., 477; Wyo., 680.
- epizootic, of cattle, 678.
- immunity and carrier problem, Calif., 180, 477.
- immunization studies with guinea pigs, 481.
- in cattle, Colo., 179.
- in cattle, mold associated with, 678.
- in cattle, papers on, 78.
- in cattle, summary, 279.
- in cattle, tests, 81; Conn.Storrs, 80, 887.
- in ewes, studies, 887.
- in mares, 81.
- in swine, studies, Mo., 480.
- in Switzerland, 887.
- papers on, 178.
- present knowledge, 381.
- station work on, U.S.D.A., 677.
- studies, 182.
- studies, use of rabbits in, 885.
- vaccine, use, Wis., 478.
- (*See also Bacillus abortus* and *Bacterium abortum*.)

Acacia spp. for planting on sand dunes, 846.
Acarapis woodi eradication, experiment in, 260.
Acarine disease eradication, experiment in, 260.
Accessory food factors. (*See* Vitamins.)
Accidents, laws pertaining to, in France, 90.
Accounting, farm. (*See* Farm accounting.)
Acetone in distillates from starters and milk, Iowa, 782.
Achatodes zeae, notes, 559.
Acid phosphate. (*See* Superphosphate.)
Acidity and plant growth, 125.
Acids—
- action on clay, 722.
- amino. (*See* Amino acids.)
- effect on plant growth, 326.
- fatty. (*See* Fatty acids.)
- nonvolatile, of blackberry, 803.
- nonvolatile, of dried apricot, 105.
- nonvolatile, of peach, 105.

Acridine, inhibitory effect on sporogony of a coccidium, 889.
Acrobasis—
- *caryivorella*, life history, 361.
- *hebescella*, studies, U.S.D.A., 54.

Acrolophus sp. injury to pastures, 156.
Actinomyces—
- sp., notes, 46.
- *viridochromogenus*, decomposition of proteins by, 310.

Actinomycosis and public health, 580.
Adenine in alfalfa juice, 712.
Adlay—
- progress report, 835.
- variety tests, Guam, 430.

Adsorption and soil acidity, Mich., 798.
Advertising farm products, N.Dak., 292.
Aedes aegypti. (*See* Yellow-fever mosquito.)
Aegilops—
- and wheat hybrids, 332, 730.
- wild species, hybridization with wheat, 138.

Aeginetia sp. as sugar cane root parasite, 47.
Aeolus elegans, notes, 156.
Aeration, studies, 824.
Aerobes, development, effect of sugar concentration in medium, 117.
Aerochoreutes carlinianus carlinianus, notes, 756.
African coast fever, theory of latency, 886.
Age and area theory, statistical methods, 225.
Agrarian—
- crisis, international, 296.
- customs of Italy, national survey, 596.
- laws in Ireland, 596.
- laws in Rumania, application, 193.
- question in Russia, history, 192.
- revolution in Russia, 192.

Agricultural—
- and small holdings schools of Norway, 598.
- bacteriology, problems and methods, 424.
- business management, 392.
- business organization principles, treatise, 591.
- census in Norway for 1923, 94.
- college education, 494.
- colleges, history, decade of, 401.
- colleges, organization list, U.S.D.A., 298.
- colleges, papers on, 597.
- (*See also* Alabama, Arizona, *etc.*)

Agricultural—Continued.
- conditions in Canada, proceedings of special committee on, 192.
- conditions in Soviet Russia, 393.
  - (*See also* Agriculture.)
- cooperation—
  - in Czechoslovakia, 94.
  - in Michigan, Mich., 795.
  - *in United States, status*, 798.
  - in western Canada, 592.
  - under Iowa cooperative laws, Iowa, 94.
- cooperative societies in England, loans to, 392.
- credit cooperative associations in Philippines, 694.
- credit legislation, value, 895.
- *depression and price level*, 493.
- depression, cause, 795.
- depression, credit aspects, 692.
- depression, nature of, 594.
- depressions, periodical, and remedies, 691.
- development on Umatilla Project, U.S.D.A., 390.
- developments in Palestine, 797.
- economics—
  - outlines, treatise, 694.
  - principles, U.S.D.A., 95.
  - research in Middle Western States, 87.
  - selected list of references, U.S.D.A., 288.
  - station work in, history, U.S.D.A., 687.
  - workers, advanced degrees held by, 7.
  - (*See also Rural economics*.)
- education—
  - in British universities, 193.
  - in England and Wales, 298.
  - in India, 193.
  - organization and administration, 298.
  - (*See also* Agricultural colleges.)
- education, vocational—
  - course for high schools, 397.
  - methods of teaching, 396.
  - *promoting*, 397.
  - teacher training in, 397.
- engineering. (*See* Engineering.)
- experiment stations. (*See* Experiment stations.)
- exports from United States, distribution, 295.
- exports, value and volume, relation, 491.
- extension, effectiveness, 95.
- extension, papers on, 598.
- *extension work, cooperative*, U.S.D.A., 298.
- Holdings Acts of Great Britain, 794.
- journals, new, 100, 199, 699.
- labor—
  - distribution, Mo., 494.
  - income, Mont., 793.
  - on Georgia farms, U.S.D.A., 190.

Agricultural—Continued.
- labor—continued.
  - on truck farms, U.S.D.A., 291.
  - requirements at Williston Substation, N.Dak., 591.
  - seasonal distribution, 689.
  - supply in Scotland during the war, 592.
  - *wages and working hours in Scotland*, 689.
  - wages, fixing, 392.
  - wages in Bombay Presidency, 89.
- law of Scotland, 296.
- machinery—
  - application of electricity to, 389.
  - description, 390.
  - guide, 286.
  - *manufacture methods*, 891.
  - metals used in, tests, 286.
  - papers on, 399.
  - press work in, 790.
  - standardization, Iowa, 788.
  - treatise, 84.
- organizations, activity in plant production in Zealand, 695.
- outlook for 1925, U.S.D.A., 92.
- policy, American, economic factors in, 796.
- possibilities in Argentina, 693.
- prices—
  - and cooperative marketing, 493.
  - Central of Norway, report, 796.
  - in Montana, 493.
  - legislative interference with, 493.
  - stabilizing, 691.
- problems, international, 290.
- production—
  - adjusting to market demands, N.H., 687.
  - *control in Great Britain*, 592.
  - index numbers, Ohio, 898.
  - *inquiry by International Labor* Office, 390.
  - relation to cooperative marketing, 895.
- products, advertising, N. Dak., 292.
- products, elasticity of supply, 294.
- products, marketing. (*See* Marketing.)
- products, transportation, relation to export trade, 295.
- program, State, basis, 792.
- programs, long-time, U.S.D.A., 493.
- readjustment in Corn Belt, 896.
- research and land valuation, papers on, 598.
- *research, relation to cotton and linen* industry, 580.
- situation in Roanoke trade area, Va., 595.
- situation, treatise, 795.
- statistics of—
  - Argentina, 693.
  - Brazil, 693.
  - California, 691.
  - Chile, 693.

Agricultural—Continued.
  statistics of—continued.
    Ireland, 596.
    Java and Madura, 396.
    New Zealand, 494.
    Newlands Project, U.S.D.A., 893.
    Rumania, 193.
    Scotland, 94.
    Sweden, 597, 898.
    Wisconsin, 298.
    Wyoming, 395.
  storage, hydroelectric power as by-product, 285.
  survey of central Georgia, 692
  teaching, papers on, 598.
  tenancy. (*See* Land tenancy *and* Land tenure.)
  tribunal of investigation, 93.
Agriculture—
  American, and immigrants, 894.
  American, position in postwar period, 288.
  and industry, price balance, 492.
  and land in Mexico, 590.
  application of electricity to, 85.
  at Pan-Pacific Science Congress, 199.
  course in, 95.
  Department of. (*See* United States Department of Agriculture.)
  economic future, 289.
  effect of price fluctuations, 895.
  German, importance of time lease in, 291.
  in Connecticut, Conn.Storrs, 797.
  in Europe and America, history, 397.
  in Island of Fernando Po, 643.
  in Rumania, 193.
  in Switzerland, 591.
    (*See also* Agricultural conditions.)
  organized, platform of, 795.
  principles, treatise, 792.
  socialist policy for, 94.
Agriolimax agrestis, control, 252.
Agromyza lantanae—
  economic importance, 257.
  notes, 654.
Agronomy—
  economic relationships, symposium, 632.
  extension work in, U.S.D.A., 695.
Agropyron repens in grain seed, 36.
Agrostemma githago in grain seed, 36.
Agrotis. (*See* Cutworms.)
Ainee, notes, 745.
Air—
  cleaners for internal-combustion engines, 485.
  compressed, extraction of sap from leaves by, 223.
  infiltration through building openings, 188.
  iodine content, 202.
  irradiated by ultraviolet light, effect on growth in rats, criticism, 264.
  (*See also* Atmosphere.)
Alanine, decomposition, 310.
Albumin, egg, nutritive value, 162.
Alcohol—
  and salts, antagonistic action, 124.
  low yield, from Indian ghur and cane molasses, 811.
  motor fuel from molasses, 790.
Alcohols, effect on insulin intoxication, 462.
Aleyrodes—
  citri. (See Whitefly, citrus.)
  nubifera, paper on, 856.
Alfalfa—
  cost of production, N.J., 135.
  crossing, Ariz., 734.
  culture experiments, Ohio, 529.
  culture in Pennsylvania, 232.
  cutting experiments, Kans., 531.
  duty-of-water experiments with, U.S.D.A., 387.
  effect of frequent cutting, 232.
  effect of sulfur, 735.
  effect on following crop, U.S.D.A., 335.
  feeding value, Ariz., 773; Ohio, 879.
  fertilizer experiments, Minn., 119.
  germination tests, Ariz., 733.
  girdle, notes, Ariz., 745.
  green, value for chicks, Ind., 173.
  hard seed in, Colo., 135.
  hay, composition, Nebr., 433.
  hay, feeding value, Ariz., 769; Mont., 772.
  hay, Hungarian, composition and nutritive value, 268.
  hay v. soy beans for dairy cows, Wis., 473.
  hay v. tankage as protein supplement, U.S.D.A., 373.
  hay worm in Kansas, 361.
  importance to State, Wis., 232.
  investigations, Wis., 432.
  late summer seeding, U.S.D.A., 335.
  manuring experiments, U.S.D.A., 334.
  nematode, notes, Colo., 154.
  optimum soil reaction for, 320.
  pasture for ewes and lambs, U.S.D.A., 370.
  pasture for pigs, U.S.D.A., 371.
  plant juice, proteins in, 712.
  proteins, studies, 364.
  Rhizoctonia affecting, 44.
  root studies, Iowa, 734.
  seed, effect of dry heat, 135.
  seed inoculation, 232.
  seed production, U.S.D.A., 335.
  seed setting, effect of tripping, 735.
  seeding experiments, Can., 530; Minn., 130.
  stem nematode, notes, N.Mex., 155.
  tolerance for alkali, 320.
  v. clover hay for cattle, Wis., 466.
  v. Sudan grass pastures for pigs, Kans., 371.
  v. Sudan hay for milk production, Kans., 779.
  v. sweet clover hay, Iowa, 779.
  v. sweet clover pasture, Minn., 171.

Alfalfa—Continued.
varieties, U.S.D.A., 334.
varieties for Kansas, 528.
varieties, forage value, U.S.D.A., 132.
variety tests, 033; Can., 530; Guam, 430; Ind., 130; Minn., 130, 131; Miss., 131; N.Dak., 334; N.Mex., 131; U.S.D.A., 834; Wyo., 133.
weevil, control, Nev., 454.
weevil, distribution, 557.
weevil, notes, 154; Colo., 154.
weevil, summary, 51.
wilt, new, notes, Iowa, 746.
wilt or root rot, notes, Colo., 146.
Algae—
assimilation in, effect of concentration of sea water, 828.
red, starch in, 519.
vitamin A synthesis by, 705.
Alkali—
action on clay, 722.
black, treatment with gypsum, Ariz., 418.
determinations, iron or nickel crucibles for, 714.
in soil, electrical method of determining, 108.
removal by irrigation, Calif., 430.
salts, effect on bacterial activities in soil, 512.
(*See also* Sodium salts.)
soils of Montana, Mont., 417.
soils, origin and management, Calif., 719.
studies, 320.
water, effect on livestock, Nev., 478.
water treatment for domestic use, Colo., 185.
Alkaloids in plants, biological significance, 826.
Almonds, production in California, Calif., 344.
Alsophila pometaria. (*See* Canker worm, fall.)
Alternaria—
atrans, notes, Ariz., 746.
solani, notes, 46.
sp., notes, 750.
Alternaria blight of potatoes in Bermuda, 852.
Altitude and slope exposure, effect on soil temperature, 19.
Alum floc properties, effect of anions, 487.
Aluminum—
accumulation in corn plants, 247.
as factor in acid soil toxicity, Wis., 416.
salts, effect on plant growth, 326.
toxic action on sugar cane, 829.
Amaranth curculio, studies, 159.
Amaranthus palmeri as silage crop, Ariz., 433.
Amebas—
human intestinal, infection of rats with, 558.
of intestinal tract of rats and mice, 558.
Amenia and Sharon Land Company, system of management, U.S.D.A., 893.
American—
Dairy Federation, proceedings, 380.
National Livestock Association, proceedings, 167.
American Society of—
Agricultural Engineers, proceedings, 399.
Animal Production, proceedings, 570.
Heating and Ventilating Engineers guide, 287, 590.
Mechanical Engineers, boiler construction code, 187.
Testing Materials, standards, 185.
Amino acid—
new, in proteins, 802.
synthesis in animal organism, 261.
Amino acids—
decomposition, 310.
effect on insulin intoxication, 462.
in corn kernel, 502.
in nutrition, rôle of alanine and indol in, 657.
in oat kernel, 501.
in rye kernel, 712.
Amino nitrogen in immature wheat kernel, 802.
Ammonia—
absorption by soils, 19.
assimilation by plants, 726.
determination in soils, 11.
determination, new micro-Kjeldahl method, 107.
fixation in Indian soils, 617.
nitrification, effect of manganese, 322.
retention in soils, 213.
Ammonification—
effect of temperature, 817.
studies, 512.
Ammonium—
bicarbonate, fertilizing value, 119.
bicarbonate toxicity to wheat sprouts, 21.
carbonate toxicity to wheat sprouts, 21.
chloride, effect on yeast growth and gluten hydration, 105.
chloride, fertilizing value, 322.
chloride toxicity to wheat sprouts, 21.
nitrate toxicity to wheat sprouts, 21.
phosphate, fertilizing value, 322.
salts, microdetermination, 10.
Ammonium sulfate—
and urea, comparison, 119.
effect on phosphorus determination, 205.
fertilizing value, 819; Ind., 189.
nitrogen availability under varying conditions, 619.
toxicity to wheat sprouts, 21.
Ammophila arenaria for planting on sand dunes, 846.
Amphicoma vulpina, notes, 555.
Amphitornus nanus, notes, 756.
Amylase, malt, isoelectric point, 106.
Amylases, chemical investigations, 408.
Anabrus longipes, notes, 756.

Anaerobic—
cultures, improved method, 609.
infections in animals, 677.
Anaphylaxis—
and tuberculin reaction, 382.
relation to tolerance or immunity, 77.
Anaplasma—
marginale, inoculation of sheep with, 183.
ovis n.sp., notes, 183, 482.
Anaplasmosis in Palestine, 678.
Anarsia lineatella. (*See* Peach twig borer.)
Anastatus bifasciatus, parasite of gipsy moth, 561.
Andropogon halepensis as weed in Belgian Kongo, 839.
Anemia—
in hens and increased pigmentation, 81.
infectious equine, changes of red blood cells in, 81.
infectious equine, in Nevada, 586.
infectious equine, pulse rate, 889.
severe, blood regeneration in, 866.
Anesthesia in treatment of botulism, 368.
Angitia sp., notes, U.S.D.A., 54.
Angoumois grain moth outbreaks, causes, 454.
Anilastus ebeninus, hyperparasite of, studies, 656.
Aniline colorants, reactions of plant cells to, 521.
Animal—
breeding, relation to recent experiments, 267.
breeding, treatise, 267.
chromosomes. (*See* Chromosomes.)
diseases—
in Baluchistan, 479.
in England, 79.
in Ireland, 884.
infectious, treatise, 884.
notes, Wyo., 680.
position of Great Britain toward, 380.
prescriptions for, 380.
prevention, 584.
report, 78.
(*See also specific diseases.*)
grafts, procedure and results, 167.
husbandry instruction, papers on, 571.
husbandry specialists in marketing program, 571.
improvement methods, 522.
nutrition—
relation to sunlight, 867; Wis., 463.
studies, Iowa, 768; Okla., 66.
pests of field and garden, handbook, 357.
pests, treatise, 855.
production, genetic contributions to, 571.
production, relation to "Meat Ring," 571.
Animal—Continued.
shelters, ventilation, station work on, U.S.D.A., 686.
tissues, insulin in, 612.
vigor, effect of castration, 733.
virus diseases, review, 783.
Animals—
body size and energy requirements, 769.
body temperatures, variations in, 884.
breeding, selection, 369.
differential sex mortality, 525.
domestic, growth and arrested development, Mo., 466.
domestic, history, effect on history of man, 67.
domestic, pathological anatomy, treatise, 277.
fattening, food requirements, 107.
generic and specific names, index, 551.
growth, relation to energy requirements, 66.
milking, effect of sunlight, Wis., 464.
symbiosis in, 856.
vertebrate, of Tasmania, synopsis, 50.
vitamin requirements, Ind., 167.
(*See also* Cattle, Livestock, Mammals, Sheep, *etc.*)
Anolis pulchellus, notes, 156.
Anomala orientalis, control, Conn.State, 450.
Anopheles. (*See* Mosquitoes.)
Anophelini, catalogue, 859.
Anthelmintics—
method of administration, 183.
tests, 681.
Anthocyanic pigments, formation, recent publications on, 125.
Anthocyanin, origin in flowers and leaves, 726.
Anthocyanins and carotins, parallelism, 627.
Anthonomus—
grandis. (*See* Boll weevil.)
pomorum, control, 558.
pomorum, notes, 652.
quadrigibbus. (*See* Apple curculio.)
Anthrax—
immunity, single intradermal injection for, 678.
in Australia, 279.
organism, growth as affected by pH, 582.
symptomatic. (*See* Blackleg.)
Antirrhinum diseases, 550.
Antiscorbutic vitamin. (*See* Vitamin C.)
Ants—
as pests in Australia, 57.
attending plant lice, list, 157.
citrus, of south China, 656.
life history, treatise, 861.
mound-building, destruction, 456.
of China, list, 656.
of Timothy Thümmel, 160.
red, on coffee tree, 156.
white. (*See* Termites.)

Anuraphis roseus, control, 359.
Apanteles glomeratus—
hyperparasite of, studies, 656.
parasites, oviposition and feeding, 560.
Aphanomyces euteiches n.sp., description, 351.
Aphelinus—
mali italica, notes, 757.
mali, notes, 358.
mali, parasite of woolly apple aphid, 861.
n.spp., description, 561.
Aphididae of Formosa, 157.
Aphidius avenae, life history, 260.
Aphids—
affecting vegetables, 255.
in cauliflower seed beds, control, 359.
on nursery stock, control, 358.
parthenogenetic-bisexual cycle and sex, 524.
rosy, control, 359.
woolly, control, 358.
woolly, immunity of apple stocks to, 255.
woolly, of apple and elm, Conn.State, 450.
(*See also* Apple aphid, woolly.)
Aphis—
brassicae. (*See* Cabbage aphid.)
forbesi. (*See* Strawberry root aphid.)
gossypii. (*See* Melon aphid.)
maidis. (*See* Corn-leaf aphid.)
pomi. (*See* Apple aphid.)
sorbi, *control*, *358*.
spiraecola, control, 358.
spiraecola, *natural enemies*, *359*.
tavaresi, life history studies, 53.
Aphycus lounsburyi, notes, *260*.
Apiaries, inspection—
in Colorado, *154*.
notes, Conn.State, 450.
Apiary inspection law, amendments, 655.
Apiculture. (*See* Beekeeping.)
Apoplexy, parturient. (*See* Milk fever.)
Aporia crataegi, notes, 652.
Apparatus—
for applying formaldehyde while planting onions, 852.
for determining moisture, 805.
for determining specific gravity of condensed milk, 314.
for maintaining constant water level, 106.
for plant and soil respiration studies, 815.
for recording gluten stretching, 105.
for recording oxygen consumption and carbon dioxide output, 206.
for testing breaking strength of straw, 886.
used in wood distillation industry, 209.
Apple—
aphid, control, 358.
aphid, woolly, enemy of, 652.
aphid, woolly, parasite of, 861.
aphid, woolly, summary, 757.
(*See also* Aphids, woolly.)
Apple—Continued.
aphids, effect of oil spray, Mo., 451.
black rot, control, Mass., 446.
blossom weevil, control, 558.
blossom weevil, notes, 652.
blotch cankers, studies, Ind., 146.
blotch, control, 241, 548; Ill., 353; Ohio, 548; Tenn., 47.
blotch control, new aspects, 753.
blotch, time of infection, 649.
buds grafted on pear trees, N.Mex., 140.
canker diseases, treatment, Mo., 447.
caterpillars, illustrations, 558.
curculio, control, 856.
diseases in Illinois, 547.
fit moth, suggested name, 652.
flowers, self-pollinated, growth of pollen tubes, 123.
leaf trumpet miner, studies, Iowa, 755.
maggot, summary, 860.
pectin, analyses, U.S.D.A., 13.
Phytophthora rot, 549.
psylla, biology, morphology and control, 53.
psylla control in Nova Scotia, 756.
root disease, notes, 147.
rust, notes, 43.
scab, control, 241, 548, 754; Ind., 139; *Mass., 446; N.H., 446, 447*; Ohio, 541, 548; Pa., 48.
scab, spore discharge, Del., 353; Wis., 444.
scab, spore dissemination, 548.
scald prevention with oiled paper, 549.
scion rooting tendencies, Iowa, 742.
seeds, germination, Iowa, 741.
soft scald, control, Iowa, 741.
sooty mold, control, N.H., 446.
stocks, immunity from attacks of *woolly aphis, 255.*
storage, requirements for, Ind., 184.
trees, burrknots of, 843.
trees, cambial activity, relation to stored food, Calif., 725.
trees, cost of growing, Ohio, 89.
trees, seedling, treatment for early fruiting, 641.
twigs, respiration during winter, 148.
Apples—
Ben Davis, variation in size and form, 636.
biennial, effect of fertilizer, Mo., 436.
blooming period and yield, Ohio, 743.
breeding experiments, Iowa, 741; U.S.D.A., 141.
cold storage, effect of freezing, N.Y. Cornell, 727.
cost of marketing, Mass., 490.
crab. (*See* Crab apple.)
culture systems, Can., 840.
dropping, cause, Wis., 438.
early, spraying experiments, Tenn., 47.
effect of cultural treatments, Ind., 139.
effect of disbudding by birds, N.H., 437.

Apples—Continued.
effect of fertilizer, N.H., 437.
effect of severe freeze, N.Mex., 140.
fertilizer experiments, 398; Can., 840; Me., 342; Ohio, 39; Pa., 439.
from single trees, keeping qualities, Can., 841.
grafting, Mich., 39.
injury from ruffed grouse, N.H., 437.
Jonathan, breakdown in, 143; Can., 841.
keeping qualities, Iowa, 741.
late blooming varieties, Mo., 437.
packing in boxes, U.S.D.A., 895.
propagation, 742.
propagation, stocks for, U.S.D.A., 141.
pruning effects, Ind., 139; Mo., 38.
pruning experiments, N.H., 437.
rest period in, 124.
ringing experiments, Ohio, 535.
self-sterility in, 39.
shipments and unloads, U.S.D.A., 293.
soil management, Can., 841.
soil management, systems, U.S.D.A., 140.
spray schedules for, Mich., 37; N.J., 37.
spraying and dusting, Conn.State, 442.
spraying experiments, 151.
spraying, materials and cost, Ohio, 535.
storage, air-cooled, Mich., 440.
storage requirements, Pa., 287.
storage studies, Can., 841.
thinning experiments, Can., 841; Okla., 141.
time for picking, Can., 841.
transportation from Australia, 260.
varieties in Wyoming, 536.
vitamin C destructive factor in, 566.
wild, self-incompatibility in, 342.
winter injury, N.H., 447.
Apricot—
brown rot, control, Calif., 449.
shot hole, notes, 43.
Apricots—
dried, nonvolatile acids of, 105.
pruning experiments, Ariz., 741.
variety tests, Ariz., 741.
Aprion pilcicolis, notes, 558.
Arceuthobium, haustoria, significance, 43.
Arginine metabolism, studies, 762.
Arion hortensis, control, 252.
Arizona—
Station, notes, 799.
Station, report, 798.
University, notes, 799.
Armadillo, chromosome numbers in, 523.
Armillaria mellea—
biology, 43.
growth reaction toward acidity, 224.
in orchard trees, Calif., 754.
new hosts, 148.
Army worm—
egg parasite, studies, 454.
parasite of, 652.
Arma plana, notes, 558.
Arnold Arboretum, salient features, 589.
Arsenic determination in plant tissue, U.S.D.A., 327.
Arsenical—
particles, electric charges, 452.
poisoning of livestock, 380.
(*See also* Calcium arsenate *and* Sodium arsenite.)
Artesian bore water, use for irrigation, 483.
Arthrosporium parasiticum, notes, 147.
Artichoke—
Botrytis rot, notes, 849.
Jerusalem, Rhizoctonia attack, 148.
Artocarpus hirsuta, notes, 745.
Artona catoxantha—
notes, 253.
parasite of, 257.
Ascaridia—
anseris n.sp., notes, 760.
galli, control, 184.
lineata, parasite of chickens, 586.
perspicillum, control, Calif., 449.
perspicillum, life history notes, 57.
perspicillum, notes, Calif., 477.
Ascaris—
lumbricoides, egg producing capacity, 760.
spp. in South Africa, life history, 884.
Ash trees—
enlarged trunk bases in, 745.
oyster-shell scale affecting, Colo., 154.
Asiatic beetle, control, Conn.State, 450.
Asparagine, decomposition, 310.
Asparagus—
growth, factors in, 822.
growth, physicochemical basis, Ariz., 421.
rust resistant strains, 543.
seed germination, Calif., 22.
variety tests, 398.
Aspergillus—
niger, nitrogen metabolism of, 122.
niger, notes, Calif., 354.
sp., notes, 850.
Asphalt—
for mineral-surfaced roofing, master specification, 388.
primer for roofing and waterproofing, master specification, 388.
Asphaltic mixtures, deformation test for, U.S.D.A., 790.
Aspidiotus perniciosus. (*See* San Jose scale.)
Association of Land-Grant Colleges—
convention, 701.
proceedings, 597.
sectional officers, 800.
Aster root aphid, life history, Ohio, 555.
Astragalus sinicus—
decomposition, effect on rice growth, 215.
prevention of injury to rice, 215.
Atmometry in South Africa, 828.
Atmosphere, sources of energy of, 816.
(*See also* Air.)

Atmospheric moisture. (*See* Humidity.)
Atractocerus kreuslerae in Western Australia, 860.
Atriplex canescens seed, viability, N.Mex., 132.
Aucuba leaves in vacuo, vitality, 422.
Automobile crankcase oil, reclamation, 590.
Avian postmortem examinations, 786.
Avitaminosis—
biochemistry, 164, 766.
effect of protein, carbohydrate, and fat hunger, 61.
nature of, 766.
(*See also* Vitamin deficiency.)
Avocado mealybug, control, 653.
Avocados—
asexual propagation, 537.
breeding experiments, 141.
Azotobacter—
chroococcum, nitrogen fixation in displaced soil solution, 216.
spp., physiological study, 25.
Babesiella ovis, notes, 183, 482.
Baby beef. (*See* Cattle, baby beef.)
Bacillus—
abortus—
and *Micrococcus melitensis*, differentiation, 381, 886.
cattle and swine strains, 481; Wis., 478.
cultural characters, 885.
cutaneous vaccination against, 279.
effect on spleen weight of guinea pig, Minn., 180.
human infections with, 279.
pathogenicity for rats and mice, 582.
pneumonic condition associated with, 785.
(*See also Bacterium abortum* and Abortion.)
acidophilus, implantation, 266.
amylovorus, notes, 43.
atrosepticus, notes, Mich., 751.
avicida, notes, N.C., 786.
botulinus infections in animals, 677. (*See also Clostridium botulinum.*)
bronchisepticus, notes, 784.
bulgaricus, implantation in intestinal tract, 267.
cereus, decomposition of proteins by, 310.
chauvoei infections in animals, 677.
coli, implantation in intestinal tract, 267.
coli in milk, destruction temperature, 276.
coli synthesis of Tsukiye vitamin by, 163.
dysenteriae in milk, destruction temperature, 276.
granulobacter pectinovorum, proteolytic action, 106.
histolyticus infections in animals, 677.
larvae, disinfectants for, 655.
Bacillus—Continued.
larvae spores, destruction, 259.
mallei, studies, 678.
melitensis. (*See Micrococcus melitensis.*)
necrophorus, treatment for, Wyo., 680.
oedematiens infections in animals, 677.
paratyphosus A and B in milk, destruction temperature, 276.
paratyphosus B, notes, 166.
radicicola. (*See* Nodule bacteria.)
sporogenes infections in animals, 677.
suipestifer, notes, 680.
typhosus in milk, destruction temperature, 276.
typhosus, resistant to soap, 609.
welchii, chronic infection with, 678.
welchii infections in animals, 677.
whitmori, studies, 678.
Bacteria—
anaerobic. (*See* Anaerobic.)
cellulose-fermenting, studies, Wis., 424.
enzymic content of spores, 25.
growth, relation to vitamins, 162.
in milk, soil, *etc.* (*See* Milk, Soil, *etc.*)
nitrifying, effect on manure, 321.
nitrogen fixation by, effect of sugar concentration, 117.
solubilization of phosphates by, 322.
Bacteriology—
agricultural, problems and methods, 424.
and immunity, laboratory manual, 783.
Bacteriophage—
constitution, 479.
in different media, studies, 480.
in root nodules of legumes, 123.
Bacteriophages, resistance to chemical substances, 224.
Bacterium—
abortum—
and *Mycobacterium tuberculosis*, mixed infection with, 885.
in feces of calves fed infected milk, 381.
infection through ingestion, 678.
infection via the eye, 480.
(*See also Bacillus abortus* and Abortion.)
campestre, description, Va.Truck, 851.
coronafaciens atropurpureum, studies, 849.
fluorescens, decomposition of proteins by, 310.
herbicola, lethal temperature, 853.
lachrymans, notes, 43.
lepiseptioum, notes, 784.
malvacearum, notes, 351; Ariz., 745.
melitensis. (*See Micrococcus melitensis.*)
pullorum, agglutination tests for, 82.
pullorum in chicks, Wis., 479.
pullorum, notes, N.C., 786.
radicicola. (*See* Nodule bacteria.)
solanacearum, notes, 46, 148.
tularense, notes, 652.

lands, biotic succession in, 826.
'er, habits and life history, 50.
s rotundiventris n.sp., description, 561.
;age, delousing, 557.
ı of Gilead canker, notes, 43.
boo disease, notes, 246.
boos, culture and uses in United States, S.D.A., 441.
ına—
diseases in Dutch East Indies, 250.
moth, synonymy, 256.
Panama disease, resistant varieties, 152.
root borer, notes, 156.
ınas—
culture in Canary Islands, 643.
vitamin A content, 162.
r of North Dakota, merits and defects, 1.
rs, rural, in Germany, 592.
erry—
eradication, progress in, 748.
use of sodium arsenite against, U.S.D.A., 327.
s spp. and parasites, 259.
: beetles, Pacific coast, life history and bits, 259.
ey—
analyses, 666.
bran, feeding value, 666.
breeding experiments, 230; Okla., 133.
cellulose, digestibility by fowls, 172.
correlated inheritance of botanical characters, 729.
culture experiments, U.S.D.A., 132, 333.
culture in Värmland, Sweden, 633.
feeding methods, 374.
fertilizer experiments, 625; Mo., 431.
fertilizer nutrients required by, 216.
gout fly, summary, 654.
leaf rust, aecial stages, 749.
meal, digestibility, 668.
nutrient requirements, R.I., 325.
optimum soil reaction for, 320.
rate of manuring experiments, Minn., 119.
rotation and tillage experiments, U.S.D.A., 528.
rotation experiments, Wyo., 133.
seeding experiments, Minn., 130.
single fertilization in, 426.
smut, control, Minn., 140.
spring and winter growing habit, inheritance of, 830.
stripe, control, Wis., 448.
v. corn for pigs, Can., 871, 872.
varieties, Calif., 430; U.S.D.A., 132.
varieties for Kansas, 528.
varieties of Sweden, 835.
variety tests, Ariz., 733; Can., 530; Ga., 230; Minn., 130, 131; Mo., 431; N.C., 734; N.Dak., 232, 334, 529; N.Mex., 131; U.S.D.A., 134, 834; W.Va., 31; Wyo., 133.
wild, notes, U.S.D.A., 834.
Barn, masonry arch, construction, Iowa, 788.
Barns—
dairy, for Nebraska, 86.
ventilating systems, Mich., 792.
ventilation, effect on animals, 571.
Basic slag. (*See* Phosphatic slag.)
Basidiobolus ranarum, light growth reaction in, 423.
Basisporium gallarum, notes, 544; Iowa, 746, 749.
Bathyplectes curculionis, notes, Colo., 154.
Batteries, treatise, 187.
Bayer 205—
mode of action on trypanosomes, 886.
summary of information, 583.
toxic effects in stallions, 786.
Bean—
beetle, Mexican—
control, 357.
distribution relation to climate, 362.
in North Carolina, 557.
in South Carolina, 363.
notes, Colo., 154; N.C., 755; W.Va., 455.
studies, Ohio, 556.
blight, studies, 350.
disease, notes, 147.
mosaic, protozoa associated with, 646.
mosaic, temperature studies, 646.
Beans—
horse. (*See* Horse beans.)
hyacinth, value, Calif., 430.
insects affecting, 755.
Lima, growth relation to seed weight, N.J., 23.
Madagascar butter, fungus disease affecting, 147.
Moki, value, Calif., 430.
moth, value, Calif., 430.
pellagra-preventive action, 662.
pink, culture, Ariz., 433.
seeding experiments, Can., 530.
snap, fertilizer experiments, Miss., 341.
soil moisture requirements, 543.
variety tests, Can., 530; Guam, 430; Minn., 131.
(*See also* Mung beans, Soy beans, Velvet beans, *etc.*)
Beaver, nematodes of, 553.
Bedbugs, control in steam-heated rooms, 453.
Bee diseases, notes, Tex., 57.
Bee moth caterpillars, immunity work with, 55.
Beef—
calf club manual, Ill., 599.
liver, vitamin content, Wis., 459.
preservation by freezing, 260.
production, winter, feeding for, 667.
scrap v. tankage for poultry, Can., 876.
scrap, value for egg production, Mo., 471.
(*See also* Cattle, beef.)

Beekeeping—
business management and profits, 591.
Erlangen yearbooks of, 860.
for beginners, Ky., 259.
treatise, 56.
Beer, vitamin content, 566.
Bees—
anatomy and physiology, treatise, 655.
and wasps, life of, treatise, 56.
brood rearing, 259.
differentiation of sex in, 655.
flight activities, U.S.D.A, 455.
foulbrood. (*See* Foulbrood.)
Japanese, biology and morphology, 160.
law pertaining to, treatise, 560.
leaf-cutter, injury to telephone poles, 154.
queen, rearing, 860; Tex., 456.
race adapted to Iowa, Iowa, 755.
relation to production of fruits and vegetables, 856.
thickening of nectars by, 652.
wintering, Wis., 451.
wintering in Colorado, 160.
(*See also* Honey.)
Beet—
armyworm, notes, Utah, 254.
leafhopper, notes, Utah, 254.
leafhopper, studies, Calif., 449.
leaf-miner, notes, Utah, 254.
pulp, dried, v. mangels for cows, Can., *674*.
root blight, control, 543.
seed disinfection, 543.
seedling rot in Italy, 47.
sugar factory control, use of enzymes in, 811.
webworm, notes, Utah, 254.
Beets—
breeding operations, hastening, Mich., 798.
canned, discoloration in, 208.
feeding value, *665*.
field or fodder. (*See* Mangels.)
seed production, 738.
solar energy used by, 508.
sugar. (*See* Sugar beets.)
Belascaris marginata in foxes, Wis., 470.
Berries. (*See* Fruits, small, *and* Raspberries, Strawberries, *etc.*)
Berseem—
analyses, 666.
studies, Calif., 65[illegible].
value, Calif., 430.
Besem grass rust, life cycle, 245.
Bibliography of—
abortion, immunity and carrier problem, Calif., 181.
agricultural programs, U.S.D.A., 493.
ants of China, 656.
Aporia crataegi, 652.
Baris spp. and parasites, 259.
blood, acid-base balance, regulation, 658.
botulism, cause, 663.
bread making and flour milling, U.S.D.A., 9.
Bibliography of—Continued.
carbon tetrachloride poisoning, 278.
Coccidae of Palestine, 157.
corn and corn products, nutritive value, Ill., 168.
corn dry rot, Iowa, 749.
Diptera, leaf-mining, N.Y.Cornell, 56.
electricity, effect on plant cells, 323.
erythrocytes and action of hemolysins, 278.
evolution, 328.
flour milling and bread making, U.S.D.A., 9.
food supply, world, U.S.D.A., 5[illegible].
foot-and-mouth disease control, 181.
fruit fly, Mediterranean, in Palestine, 654.
fruit growing, 641.
ham beetle, *red*-legged, 759.
heat transmission of insulating materials, 685.
hemp, 235.
heredity in rabbits and guinea pigs, 522.
insecticides for Japanese beetle, 259.
insects, social, 156.
land problems in United States, 894.
liming, effects, 220.
marketing agricultural products, U.S.D.A., 91.
metabolism, basal, 764.
mosaic disease, Iowa, *748*.
mosquitoes, anopheline, 559.
olive fly, *654*.
osteomalacia and diet, 461.
paranasal sinuses, 182.
pectin preparation from citrus, U.S.D.A., 14.
protein chemistry, 105.
protein metabolism, 762.
proteins, decomposition, 311.
proteins, molecular weight, 711.
rural life, U.S.D.A., *207*.
sex control, 732.
soil colloids and tillage, 589.
sorghum smuts, U.S.D.A., 752.
starch, gelatinization temperatures 410.
take-all disease, N.Y.Cornell, 348.
tea diseases, 49.
trematodes of Brazil, 357.
tsetse flies, 257.
tuberculosis of swine, Nebr., 384.
Binder twine tests, Ind., 184.
Bio-ecology, principles and methods, 825.
Biological control in California, commercial development, 857.
Bios-like substance, isolation, 204.
Biozonalogical studies, 652.
Bird islands of Peru, treatise, 756.
Birds—
ailments, accidents, and treatment, 786.
and animals of Great Britain, treatise, 251.
British, popular account, 252.
Danish, of house and garden, 552.

Birds—Continued.
destruction of corn borer larvae by, 757.
diving, treatise, 855.
external parasites, 552.
homes for, U.S.D.A., 856.
introduction to study of, 252.
nests, fauna of, 552.
North American, migration, 51.
of an Indian garden, treatise, 651.
of Portugal, 552.
relation to man, treatise, 756.
sex determination and differentiation, 524.
sex reversal in, 30.
sex-limited characters, 525.
without gonads, studies, 733.
Bituminous mixtures, stability test, U.S.D.A., 483.
Black—
corn weevil, notes, N.C., 755.
flies, collections and records, N.H., 451.
sand mite, notes, 657.
scale parasites, Calif., 449.
scale, parasites and hyperparasites of, 260.
tongue, yeast treatment, 662.
Blackberries—
breeding experiments, Tex., 643.
culture, Mo., 241.
nonvolatile acids in, 803.
Blackberry—
blue stem, notes, 43.
leaf anthracnose, notes, 547.
products, detection of spoilage in, 807.
Blackhead—
in chicks, progress report, 681.
in turkeys, control, 786; U.S.D.A., 889.
in turkeys, studies, Calif., 477, 787.
Blackleg—
diagnoses, 678.
immunizing agents, tests, 181.
precipitin serum, preparation, 79.
Blasting directions, 84.
Bleichsand soils, formation, 115.
Blindness in fowls, 681.
Blissus leucopterus. (*See* Chinch bugs.)
Blister—
beetles on beets, Utah, 254.
canker, control, Iowa, 753.
Blood—
acid-base balance, regulation, 657.
calcium in experimental scurvy, 165.
calcium in, relation to calcium ingestion, 261.
cells, red, irradiated, effect, 568.
chemistry in clinical medicine, 411.
dried. (*See* Dried blood.)
enzymes in experimental scurvy, 165.
in dietary deficiencies, bactericidal action, 367.
lipoid phosphorus determination in, 12.
meal, vitamin in, 571.
of calf and cow, complement in, Mo., 479.
of insects, pH value, 856.
Blood—Continued.
of normal horses, 586.
phosphates, determination, 12.
phosphates, relation to carbohydrate metabolism, 763.
pressure of dogs, 482.
regeneration in severe anemia, 866.
serum, inorganic bone-forming elements in, 61.
serum of rachitic chicks, 671.
serum, sodium determination in, 12, 206.
sugar determinations, reduction tables for, 13.
Blowflies and parasites, 160.
Blueberry spittle bug egg, Conn.State, 450.
Bluebottle fly, parasitism of, 160.
Boarmia sp., notes, 558.
Body temperatures, variations in, 884.
Boiler construction code of A.S.M.E., 187.
Boll weevil—
control, Miss., 231; S.C., 759.
control by airplane, 363.
effect of climatic conditions, La., 553.
notes, N.C., 755; Okla., 155.
poisoning, progress in, Miss., 56.
Bollworm—
notes, 559; N.Mex., 155.
pink, control in the Sudan, 158.
pink, in cotton seed, control, 55.
pink, in Porto Rico, 156.
pink, summary, 51.
Bollworms in French West Africa, 361.
Bombyx mori. (*See* Silkworms.)
Bone—
ground, analyses, N.J., 220.
products and manures, treatise, 724.
Bones, ununited fractures of, studies, 61.
Books on—
agricultural business organization, 591.
agricultural economics, outlines, 694.
agricultural machinery, 84.
agricultural situation, 795.
agriculture, 792.
agriculture in Europe and America, 397.
animal breeding, 267.
animal diseases, infectious, 884.
animal pests, 357, 855.
animals, domestic, pathological anatomy, 277.
ants, 861.
bacteriology and immunity, 783.
beekeeping, 56.
bees, anatomy and physiology, 655.
bees and wasps, life of, 56.
bees, law concerning, 560.
bird islands of Peru 756.
birds, diving, 855.
birds of an Indian garden, 651.
birds of Great Britain, 251.
birds, relation to man, 756.
bone products and manures, 724.
bridges, reinforced concrete, 683.
building construction, mechanics of, 684.
bulbs, culture, 40.
butter and cheese making, 278.

Books on—Continued.
butterflies, 558.
butterflies, British, 255.
canaries, Yorkshire, 855.
canning, 716.
carbon compounds, pharmacology, 309.
cattle production, 67.
cells, development and heredity, 820.
cement, Portland, prices, 590.
cheese and butter making, 276.
chemical analysis, 503.
chemistry, 801.
chemistry, biological, 711.
church, rural, 797.
cities, American, suburbs of, 797.
clothing for women, 398.
colloid chemistry foundations, 802.
colors and varnishes, 891.
cotton cellulose, chemistry and technology, 412.
crop production in India, 335.
cucumbers, 640.
dahlias, culture, 242.
dairy analysis, 808.
dairy engineering, 791.
diabetes, new method in, 266.
dietetics for nurses, 456.
drug plants, 225.
economic history, American, 393.
economic history of Tudor period in England, 93.
education, adult, in Scandinavia and America, 94.
elasticity, applied, 386.
electricity, encyclopedia of, 686.
endocrine diseases, 266.
engineering, highway, 589.
entomology, 252, 651.
environment, organic adaptation to, 27.
erythrocytes and action of hemolysins, 278.
every day life, science of, 693.
evolution, 225, 328.
farm accounting, 95.
farm shop work, 186.
farm woman, American, 297.
farm zone, 797.
farmer's church, 797.
farmers' movements in Canada, 895.
farming, 898.
fertilizers, 819.
food and dietetics, 456.
food buying and markets, 899.
food preservation, 208.
food supply of New England, 394.
forest mensuration, 244.
forest zoology, 651.
forestry, 42.
fruit growing, 641.
fruit trees, pruning, 641.
fruits of Great Britain, 843.
fruits of Temperate Zone of North America, 37.
fruits, small, 536.
fruits, small, culture, 843.
gardening, 40, 144, 640.

Books on—Continued.
gardening, tropical, 844.
genetics, 522.
geography, commercial, 95.
geography, economic, 694.
geology, engineering, 587.
gladioli, varieties and culture, 644.
heredity, 425.
heredity, laws and mechanism, 226.
houses, model, 694.
immunity in natural infectious disease, 581.
insects, 357.
insects of trees and shrubs, 252.
kitchens, modern, arrangement and equipment, 899.
land policies, public, history, 88.
law of diminishing returns, 290.
lawn making, 139.
livestock judging and selection, 667.
manures and fertilizers, 819.
marketing, readings in, 694.
materials, building, fundamental properties, 284.
materials of construction, 284.
materials, resistance of, 684.
materials, strength of, 185.
meat hygiene, 278.
meat, military, and dairy hygiene, 783.
metabolism, basal, 764.
milk and its products, 581.
milk secretion, 72.
mistletoe, 728.
motor trucks, 187.
motors, farm, 590.
Mount Rainier National Park, 744.
North America, 397.
organic evolution and heredity, 627.
organic microanalysis, 714.
peanuts, 236.
peasant industry, 297.
physics, 386.
plant histology methods, 420.
plant movements, developmental, 324.
plant physiology, 623.
plants for elementary schools, 694.
pomology, systematic, 37.
poultry farming, principles, 174.
poultry products, marketing, 397.
prices, science of, 898.
protoplasm, colloid chemistry of, 309.
pruning, 641.
rats, albino and Norway, 274.
refrigeration, mechanical, 188.
research, organic, 309.
rice production, 636.
roads, construction, 388.
roads, construction and maintenance, 186.
roads, English, 186.
roses, 539, 845.
rural England, 698.
rural living, 798.
rural Pennsylvania, 595.
rural social psychology, 602.
sanitation, domestic, 196.
science, general, 693

Books on—Continued.
science of everyday life, 693.
sewage disposal, 188.
sewing materials, 496.
shrubs and trees, 41.
silviculture, 644.
spices, 9.
storage batteries, 187.
strawberry culture, 343.
structural engineering, 388.
sugar manufacture, 411.
swine husbandry, 69.
textiles, 694.
textiles, cleaning and dyeing, 507.
textiles, terms and definitions, 412.
timber, seasoning and preservation, 684.
tomatoes, culture under glass, 842.
trees and shrubs, 41.
trees and shrubs in British Isles, 243.
trees, flowering, of India, 243.
trees of California, U.S.D.A., 243.
varnishes and colors, 891.
vegetable diseases, 246.
vegetables, 640.
vegetables, culture, 40.
veterinary hygiene, 278, 884.
veterinary medicine, biological diagnosis, 884.
Wales, 1284–1415, 393.
wasps and bees, life of, 56.
water fowl, 651.
woman on the farm, 297.
zoology, Danish forest, 651.

Borax—
as disinfectant for citrus fruit, 355.
standardizing acids and bases with, 714.

Bordeau mixture—
copper hydroxide as substitute for, 241.
effect of composition on plants, N.H., 444.
efficiency of "stickers" in, Iowa, 755.
homemade v. commercial, Minn., 131.
properties, 348.

Boric acid—
and borax, effect on broad beans, 26.
as disinfectant for citrus fruit, 354.

Bostrichidae of French tropical Africa, 259.
Botanical pen-portraits, treatise, 225.
Botryodiplodia theobromae, notes, 147.
Botrytis cinerea on artichokes, 849.

Botulinus toxin—
effect of digestic juices, 367.
production, effect of *Clostridium sporogenes*, 609.

Botulism—
anesthesia and sedatives in treatment of, 888.
organisms causing, 662.

Boxwood—
leaf miner, studies, Md., 559.
stem rot, notes, 48.

Boxwoods, descriptions, 644.

Brachiaria ciliaris as weed in Belgian Kongo, 839.
Brachysporium sp., notes, 750.
Brachystegus hopliaivora, notes, 656.
Brachytrypes sp., notes, 558.
Bracon spp., studies, 259.
Bradynotes chilcotinae, notes, 756.
Bramble diseases, notes, 547.
Brans, Swedish, feeding value, 666.
(*See also* Rye bran, Wheat bran, *etc.*)
Brassica, forms, Mendelian inheritance between, 630.

Bread—
brown and white, nutritive value, 265.
making and flour milling, bibliography, U.S.D.A., 9.
making, effect of water containing free chlorine in, 161.
making, H-ion concentration in, 261.
quality, judging by size of pores, 261.
quality, judging, six cardinal points, 261.
substitutes in diabetic diets, 266.
(*See also* Flour.)

Bregmatothrips iridis n.sp., description, 52.
Brevicoryne brassicae. (*See* Cabbage aphid.)
Bridges, reinforced concrete, treatise, 683.
Brill's disease in lower Rio Grande Valley, 360.
Brome grass bacterial disease, studies, 849.
Bromocresol green, dissociation constants, determination, 714.
Bronchitis, epizootic, among chickens, 681.
Bronchopneumonia in calves, 279.

Broomcorn—
in Oklahoma, 532.
variety tests, U.S.D.A., 834.

Brown rot—
control, Ga., 239.
fungi, American, studies, Md., 448.

Brown-tail moth, summary, 51.
Brucella melitensis, distribution, 886.

Buckwheat—
feeding value, Can., 871.
growth, relation to seed weight, 23; N.J., 23.
variety tests, Can., 580; W.Va., 31.

Bud development, correlation in, 825.
Bud mutations in citrus, 729.
Buffalo, nematodes of, 553.
Buffer mixtures, new set, 610.
Building construction, mechanics of treatise, 684.
Buildings, design, minimum live loads allowable for, 684.
Bulb fly, lesser, life history notes, 361.
Bulbs, culture, treatise, 40.
Bulls, impotency in, 278.
(*See also* Sires.)
Bunt. (*See* Wheat smut, stinking.)
Bureau of Agricultural Economics, foreign outposts of, 795.

Butter—
and cheese making, treatise, 276.
Argentine, Reichert-Wollny indexes 882.
Canadian pasteurized, mold in, 676.

Butter—Continued.
- carbonated, manufacture, 882.
- carbonated, studies, 178.
- coconut and palm fats in, estimating, 806.
- *effect on quality of ice cream, 677.*
- fat. (*See* Milk fat.)
- faulty flavors in, 276.
- fishy flavor in, 882.
- improvement of flavor and keeping quality, Iowa, 782.
- making, bacteriological background, Mich., 781.
- making, cooling cream for, Ind., 177.
- making, effect of neutralizing sour cream for, Wis., 475.
- making, neutralizing cream for, 581.
- pasteurization temperature of cream for, 178.
- *production in Minnesota, 277.*
- spontaneous decomposition, 712.
- vitamin A in, inactivating action of other fats or oils, 62, 377.

Butterflies—
- British, life history, treatise, 255.
- in India, 53.
- in Sakhalin, 858.

Butterfly lore, treatise, 558.

Buttermilk—
- analyses, Conn.State, 657.
- commercial manufacture, Okla., 177.
- dried, value for chicks, Ind., 173.
- products, feeding value for pigs, Minn., 469.
- v. water for chicks, Can., 876.
- value for fattening poultry, Iowa, 778.

Butternut Melanconis disease, 650.

Cabbage—
- aphid, dusting experiments, Conn.State, 450.
- aphid, notes, N.Mex., 155.
- diseases, control, 544.
- diseases, studies, Wis., 443.
- fertilizer experiments, 142; N.Mex., 140.
- Fusarium-resistant, studies, 849.
- hybridization technique, 842.
- maggot fly, substances attractive to, Conn.State, 450.
- seed selection for disease resistance, Mo., 444.
- shipments and unloads, U.S.D.A., 298.
- wire stem, N.Y.Cornell, 44.
- worms, poisons for, 52.
- yellows resistant strains, 548.
- yellows, tests, Iowa, 746.

Cacao—
- butter adulteration, detection, 504.
- culture, 648.
- pollination, studies, 587.
- products, analyses, Conn.State, 657.

Cacoecia—
- *argyrospila*. (*See* Fruit-tree leaf-roller.)
- *fumiferana*, studies, 559.
- *rosaceana*. (*See* Rose leaf tyer.)

Calendra granaria. (*See* Granary weevil.)

Calcarats, value, Calif., 430.

Calcium—
- and phosphorus metabolism, factors affecting, 364.
- arsenate, free calcium hydroxide in, 110.
- assimilation, dietary factors in, 379.
- carbonate, effect on decomposition of organic matter in soil, 219.
- carbonate, effect on nitrification in peat soils, 118.
- carbonate, transformation of calcium oxide into, 516.
- chemistry, manufacture, and use, 621.
- chloride action on plants and soils, 21.
- chloride, curing concrete with, U.S.D.A., 84.
- chloride, fertilizing value, 121.
- *cyanamide and acid phosphate mixtures, chemical changes in, 713.*
- cyanamide, total nitrogen in, determination, 611.
- cyanide—
  - as greenhouse fumigant, 357.
  - dust for grape leafhopper, 454.
  - for destruction of mound building ant, 456.
  - use, Calif., 449.
  - use against pocket gophers, 551.
- deficiency, effect of ultraviolet radiations, 763.
- effect of manure and irrigation, 218.
- elimination in experimental scurvy, 165.
- excessive in maternal diet, effect on young, 263, 563.
- hydroxide, free, in calcium arsenate, 110.
- in blood of pigeons, relation to sex, 672.
- in serum, determination, 505.
- in soils, studies, Mo., 415.
- metabolism in osteomalacia, 460.
- metabolism, studies, 261.
- oxide, effect on decomposition of organic matter in soil, 219.
- oxide, transformation into calcium carbonate, 516.
- requirements of human body, 161.
- *soaps, solubility, 205.*
- soluble, as indicator of returns from lime, 819.
- supply of hens, relation to hatchability of eggs, 577.
- transference from eggshell to embryo, 878.
- (*See also* Lime.)

Calendrinae, generic characters, 558.

Calf—
- blood, bactericidal properties, Mo., 479.
- effect of diminished thyroids, 369.
- liver, vitamin content, Wis., 459.
- meal, feeding value, N.Y.Cornell, 675.

California—
- Station, notes, 97, 300, 498, 799.
- Station, report, 496.
- University, notes, 97, 300, 498.

Calliephialtes grapholithae, notes, U.S.D.A., 54.
Calliphorine myiasis in domesticated animals, 159.
Calonectria—
  graminicola, notes, 44.
  sp., notes, 147.
Calorimeter—
  differential, description, 315.
  for small animals, 107.
Calves—
  bacteriology of intestinal tract, 182.
  beef, growth as affected by protein, 571.
  beef, winter feeding, Mont., 771.
  economical rations for, 571.
  fatty acids in intestinal tract, N.Y.Cornell, 378.
  milk substitutes for, Mass., 473.
  newborn, hydropic stages in intestinal epithelium, 887.
  newborn, skin disease affecting, Wis., 479.
  over-term, sex of, 428.
  raising on calf-meal gruel, N.Y.Cornell, 675.
  skim milk v. grain for, Wyo., 674.
  yeast as supplementary feed, 176.
Camelina sativa in grain seed, 36.
Camels, treatment with Bayer 205, 583.
Camote vines, feeding value, 575.
Camphor—
  Borneo, root disease, 148.
  scale, Japanese, summary, 653.
  scale, summary, 51.
  thrips, relation to fungus disease of *Cinnamomum camphora*, 650.
Campoplex ferrugineipes, notes, 652.
Canals, loss of seepage water from, 386. (*See also* Drainage.)
Canaries, Yorkshire, treatise, 855.
Cane. (*See* Sugar cane.)
Canker worm, fall, in mountain forests, N.C., 755.
Cannabis sativa, cytokinesis in, 27.
Canned—
  beets, discoloration in, 208.
  food, perforation studies, 208.
  food, research work with, 208.
  foods, vitamins in, 566, 764.
  tomatoes, spoilage studies, 209.
Canning—
  factories, statistics, 277.
  processes, treatise, 716.
Cantaloupes. (*See* Muskmelons.)
Capira angustilineata, notes, 558.
Caprifig seed, results from sowing, 844.
Caproic acid derivatives—
  for lysine synthesis, 261.
  preparation, methods, 204.
Capsella bursa-pastoris in salted soil, seed anomalies, 628.
Carbohydrate—
  metabolism in experimental scurvy, 164.
  metabolism of leaves, 821.
Carbohydrate—Continued.
  metabolism, relation to blood phosphates, 763.
  storage in corn endosperm, 421.
Carbohydrates—
  and vitamin B, interdependence, 265.
  determination, method, 504.
  in plant tissue, effect of drying, 803.
  in plants, colorimetric determination, 108.
  soluble, in growing wheat grains, 725.
  translocation in sugar maple, 24.
Carbon—
  bisulfide, use against Japanese beetle, N.J., 258.
  compounds, pharmacology, treatise, 309.
  determination in organic compounds, 805.
  dioxide—
    concentration, effect on root elongation, 222.
    diffusion ratio in bread doughs, 410.
    effect on grasshoppers, 254.
    effect on lettuce, Ohio, 519.
    effect on tomatoes, 640.
    in soil gases, 422.
    output, apparatus for recording, 206.
    production, 418.
    stimulation of spore germination, 423.
  disulfide as fumigant for nursery stock, 453.
  disulfide emulsions, use against Japanese beetle, U.S.D.A., 455.
  disulfide, use against white grubs, 155.
  disulfide-sulfur emulsion, preparation, 452.
  in soil, effect of manure and irrigation, 218.
  in soil, rate of accumulation and cost, Mo., 414.
  nitrogen ratio in soil, effect of microorganisms, 818.
  organic, determination by chromic acid method, 714.
  semimicrodetermination, arrangement of apparatus, 313.
  tetrachloride—
    absorption and excretion of the anthelmintic dose, 585.
    anthelmintic value, Calif., 477.
    poisoning, pathological histology, 278.
    treatment of sheep, 584, 585.
  trichloride, anthelmintic value, 787.
Carbonic acid reduction, 26.
Carbureter intake, location for, 685.
Cardamine pratensis, anomalous and transitional plants, 128.
Carotin, preparation and properties, 501.
Carotins and anthocyanins, parallelism, 627.
Carpocapsa pomonella. (*See* Codling moth.)
Carpoxenia in citrus, 729.

Carrots—
analysis, Can., 135.
variety tests, Can., 530; Minn., 130; N.Dak., 334.
Casein—
decomposition, 810.
pellagra-preventative action, 662.
Castorstrongylus castoris n.g. of beaver, 553.
Castration—
effect on metabolism, 665.
effect on voluntary activity of rats, 733.
nutrition, and growth, 268.
Catalysis, rôle in analytical chemistry, 8.
Catalyzers, biochemical, study of effect of plant pulp, 223.
Catarrh—
contagious nasal, in fowls, 279.
malignant, of cattle, 279.
Cats—
cuterebrid larvae in, U.S.D.A., 482.
Siamese, crosses with, 228.
Cattle—
baby beef—
cost of production, Can., 667.
feeding, Minn., 467.
feeding experiments, Okla., 169.
finishing, 272; Mich., 773.
minerals for, Ohio, 574.
beef—
cost of production, Ind., 189.
feed requirements in winter, 667.
feeding experiments, Ariz., 769; Can., 867; Minn., 169; Mo., 466.
production, Mo., 494.
rations for, Okla., 66.
breeding—
and new views of heredity, papers, 269.
associations, use of scientific data, 270.
promotion by authorities, papers on, 270.
Breton, breeding in Finistère, 67.
calorimetry experiments, methods, 578.
characteristics of improvement, 270.
cost of wintering, 793.
dairy—
breeds, history and characteristics, U.S.D.A., 175.
effect of hayless rations, Mich., 780.
feeding, Minn., 76.
feeding experiments, 579; Can., 674, 878, 879; Iowa, 779; Kans., 779; Ohio, 579; Va., 578; Wis., 472; Wyo., 673.
mineral requirements, Mich., 379; Ohio, 580.
(*See also* Cows.)
depraved appetite, hay as cause, 682.
dimension-weight index for, 571.
diseases, relation to milk supply, 580.
(*See also* specific diseases.)
Cattle—Continued.
feeding experiments, 571; Iowa, 770; N.C., 770; Ohio, 96.
(*See also* Cattle, beef, *and* dairy, Calves, Cows, *and* Steers.)
feeding, newer views on, papers, 269.
feeding, relation to farm management, Ill., 88.
genital diseases, 162.
grubs in North Wales, 758.
grubs in Switzerland, 758.
Holstein-Friesian, inheritance of milk production, 72.
inheritance of black and red coat colors, 128.
metabolism during standing and lying, 271.
paranasal sinuses of, 182.
plague. (*See* Rinderpest.)
poisoning. (*See* Plants poisonous *and* specific plants.)
production, textbook, 67.
Pusa pedigree herd, 175.
range, production, 268.
ratio of births and slaughter, 167.
Shorthorn *Pedigrees-Bates Duchesses*, Mendelian analysis, 571.
tick. (*See* Ticks.)
twin births in, seasonal distribution, Wis., 428.
(*See also* Calves, Cows, Heifers, *and* Steers.)
Cattleya fly, life history and control, 362.
Cauliflower head, morphological nature, 521.
(*Cecidomyia*) *Mayetiola destructor*. (*See* Hessian fly.)
Celery—
blight, control, Conn.State, 442.
late blight, notes, 147.
leaf-tyer, control, 360.
mosaic, notes, 43.
shipments and unloads, U.S.D.A., 293.
yellows resistant strain, 849.
Cell—
artificial, with bicolloidal membranes, 822.
wall and external medium, 220.
Cells—
development and heredity, treatise, 829.
somatic and germ, relation, 426.
(*See also* Plant cells.)
Cellulose—
chemical products, 718.
cotton products, 718.
cotton, chemistry and technology, 412.
decomposition, 25.
decomposition by bacteria, studies, Wis., 424.
effect on crop growth, 121.
in wood, determination, 110.
of barley, digestibility by fowls, 172.
of jute, studies, 812.
Cement, Portland, prices, treatise, 590.
(*See also* Concrete.)

Cenchrus carthaticus as weed in Belgian Kongo, 839.
Centipede, garden, control by flooding, Calif., 450.
Centipedes, venom of, effect, 157.
Centrosomal force, nature of, 323.
Cephalosporium acremonium, notes, Ill., 851; La., 850.
Cephus cinctus. (*See* Sawfly, western wheat-stem.)
Ceratitis capitata. (*See* Fruit fly, Mediterranean.)
Ceratostomella fimbriata, proposed name, 854.
Cercospora—
- *nicotianae*, notes, 148.
- sp., notes, 152.

Cercosporella antirrhini, notes, 550.
Cereal—
- diseases, 246.
  - (*See also specific hosts.*)
- Fusarium blight, studies, 43.
- gruel feeding, 457.
- products, fat extraction method, 807.
- take-all disease, studies, N.Y.Cornell, 348.

Cereals—
- and legumes, production in Spain, 396.
- cultural investigations, Can., 530.
- feed value as determined by eggs, 375.
- nutrient requirements, R.I., 325.
- physiological studies, 501, 502, 712.
- winter and spring, characteristics, 231.
- winter resistance, Ga., 230.
- (*See also* Grain *and specific grains.*)

Cerebella sorghi-vulgaris, notes, 147.
Cerebrospinal meningitis in horses, 279.
Cereus, transpiration and stomatal movement, 824.
Ceroplastes destructor, destruction by predacious Helix, 856.
Ceroplastes rubens, parasites of, 160.
Ceroplastes spp. in Japan, 158.
Cerostoma xylostella, notes, 257.
Cestodes parasitic in fish, 761.
Chaerocampa elpenor, parasite of, 55.
Chaetodacus tryoni, studies, 302.
Chamiza. (*See Atriplex canescens.*)
Cheat grass, control, U.S.D.A., 334.
Cheese—
- and butter making, treatise, 276.
- Camembert, salting, 883.
- cottage, manufacture and use, U.S.D.A., 475.
- factories, cooperative, in United States, 297.
- fruity odor in, 475.
- Kingston, flora of, 178.
- making, relation to mammary microflora, 581.
- production in Minnesota, 277.
- quality, effect of clarification of milk, 178.
- ripening, rapidity of, factors affecting, 581.
- stinker, cause, Wis., 475.

Cheese—Continued.
- Swiss, production, improved methods, Wis., 474.
- Weisslaker, fat, water, and salt content, 277.

Cheeses, soft, directions for making, Iowa, 76.
Cheiloneurus—
- *ceroplastis* n.sp., notes, 160.
- *inimicus* n.sp., notes, 260.
- *lincascapus*, notes, 260.

Chelidonium cinctum in Mysore, 259.
Chemical analysis, treatise, 503.
Chemicals for destruction of mosquito larvae, 859.
Chemistry—
- and the State in Great Britain, 408.
- biological, laboratory manual, 711.
- fundamentals, textbook, 801.
- in twentieth century, treatise, 801.
- introduction to literature of, 408.
- organic, methods, 205.
- progress in, 711.

Chenopodium album in grain seed, 36.
Cherries—
- breeding experiments, U.S.D.A., 141.
- Compass, plum as stock for, U.S.D.A., 536.
- harvesting and canning, Oreg., 440.
- planting and care, studies, Oreg., 643.
- pollination studies, 643; Oreg., 642.
- propagation studies, U.S.D.A., 141.
- reddening, 521.
- spray schedules for, Mich., 37.
- time of pruning, Can., 840.
- varieties in Wyoming, 536.
- winter protection, U.S.D.A., 141.

Cherry—
- aphid, black, control, 358.
- bacterial disease, Colo., 146.
- diseases in Illinois, 547.
- fruit fly, forms, Mich., 158.
- leaf beetle, notes, Mich., 557.
- leaf spot, control, 241.
- leaf spot, residual effects and control, Mich., 448.
- morello, origin and characteristics, 143.
- seeds, late stratification, effect, 641.
- trees, effects of sod in relation to moisture and nitrates, N.Y.Cornell, 642.

Chestnut—
- bark disease, case of resistance to, 650.
- canker, notes, 43.

Chicken liver, vitamin content, Wis., 459.
Chickens—
- dry picking, U.S.D.A., 878.
- effect of time of hatch, Okla, 173.
- intestinal roundworm of, 586.
- (*See also* Chicks, Fowls, Hens, Poultry, *and* Pullets.)

Chicks—
- early embryology, 577.
- embryonic, gonad grafts in, 681.
- feed requirements, Ohio, 71.

Chicks—Continued.
feeding, N.Mex., 173; Mo., 273.
feeding and cost, Mo., 472.
feeding experiments, 609; Minn., 472.
growth rate, Iowa, 778; Mo., 472.
leg weakness in, effect of sunlight and green clover, 876.
leg weakness in, factors affecting, Ohio, 576.
nutrient requirements, 273.
rachitic, blood of, 671.
raising for profit, Ill., 71.
rearing indoors, 273; Ohio, 576.
Chiggers—
and clover mites, Ohio, 899.
native host of, 656.
North American, studies, 656.
Child—
care, teaching to girls, 695.
nutrition, psychology of, Mo., 495.
Children—
food requirements, 263.
(*See also* Infants, feeding.)
immunizing against tuberculosis, 80, 887.
Chili pepper wilt, studies, N.Mex., 146.
Chinch bug—
barriers, Kans., 453.
control, Mo., 451.
false, on beets, Utah, 254.
in Porto Rico, 156.
Chir, volume table for, 541.
Chlorides, action on plants and soils, 21.
Chlorine—
in grains, effect of irrigation water, 735.
in water, effect on bread making, 161.
Chlorophyll—
and vitamin A, 10.
assimilation, energy yield, 827.
deficiencies in sorghum, 27.
development in corn, complementary genes and linkage relations, 30.
formation in darkness, studies, 727.
irradiated, effect, 568.
pigments in mosaic leaves, Iowa, 748.
synthesis, theory, 826.
Chlorops taeniopus, summary, 654.
Chokecherry, poisonous to livestock, Nev., 478.
Cholesterol, irradiated, antirachitic value, 568, 767.
Chondriosomes, evolution in embryonic sac of Liliaceae, 727.
Chorea, hereditary in four generations, 427.
Christmas tree plantations, Mich., 845.
Chromosomal mutants in Datura, primary and secondary, 226.
Chromosome, third, of Drosophila, crossover modifiers in, 30.
Chromosomes—
accessory, material for demonstrations, 226.
and genes, relation to sex, 324.
and heredity, 126.
endocrines, and heredity, 827.
Chromosomes—Continued.
in Avena, 829.
in corn, 523.
in Liliaceae, survey, 329.
in mammals, 523.
in rice, differences, 831.
in triploid Daturas, studies, 227, 328.
in triploid Oenothera hybrid, 126.
sex, studies, 731.
type forms in plant families, 328.
Chrysanthemum yellows—
control, 98.
in greenhouses, 355.
Chrysanthemums, culture, 845.
Chrysophlyctis endobiotica resting spores in soil, 46.
Church—
rural, treatise, 797.
windows, action of lichens on, 50.
Chymase in *Solanum elaeagnifolium*, 324.
Cider, apple, making, Mich., 798.
Cimex rotundatus, parasite of, 552.
Cinnamomum camphora, disease of, 650.
Cities, American, suburbs of, treatise, 797.
Citric acid in milk powder, 505.
Citrus—
ant of South China, 656.
aphid, black, life history studies, 53.
aphid, control, 757.
aphid, natural enemies, 359.
aphid, new, paper on, 856.
blast and black pit, 250.
die-back, notes, 250.
diseases, physiological, cause, Calif., 449.
fruit melanose and stem-end rot, 650.
fruits, borax as disinfectant for, 354.
fruits, carpoxenia and bud mutations in, 729.
fruits, culture in Southwest, U.S.D.A., 643.
fruits, fertilizer experiments, 841.
gummosis, summary, 250.
mites, control, 856.
orchards, effect of soil management, Ariz., 740.
pectin preparation, U.S.D.A., 18.
scab, range of hosts, 855.
trees, fertilization, Calif., 241.
trees, protection against cold, Miss., 239.
trees, windburning, 152.
varieties susceptible to *Gloeosporium limetticolum*, 549.
white fly. (*See* White fly, citrus.)
(*See also* Lemons, Oranges, etc.)
Cladosporium—
album n.sp., notes, 49.
fulvum, notes, Ind., 146.
Clastoptera—
obtusa on cultivated grapes, Ariz., 764.
proteus, notes, Conn.State, 450.
Clausenia, new genus, erection, 160.
Clays, treatment affecting *gel or sol formation*, 418.
Clemson College, notes, 499.

Climate—
alpine, effect on floral morphology and anatomy, 728.
and crop risks in Williston area, N.Dak., 509.
and meteorology of South Africa, 813.
and rain-grown cotton, 14.
at Northern Great Plains Field Station, U.S.D.A., 113.
effect on fruit industry of United States, 111.
effect on wheat rust development, 543.
of cut-over lands, Idaho, 509.
of Mediterranean area and California and Chile, comparison, 615.
of Netherlands Indies, 812.
relation to sugar production in Java, 509.
tropical, effect on man, 764.
(*See also* Meteorology.)
Climatic—
control, factors in, 508.
cycles, studies, 825.
factors from study of redwoods, 614.
Climatological data. (*See* Meteorological observations.)
Clitocybe tabescens, notes, 354.
Clostridium—
botulinum, effect of *C. sporogenes* on, 609.
botulinum, pathogenicity, 784.
(*See also Bacillus botulinus.*)
chauvei and *C. edematis*, differentiation, 884.
edematis and *C. chauvei*, differentiation, 884.
Clothing—
and textiles, Government publications, list, U.S.D.A., 299.
delousing, 557.
for women, treatise, 398.
selection, teaching problems, 398.
Clover—
breeding experiments, 230.
crimson, source of seed test, N.C., 735.
culture experiments, La., 528; Ohio, 529.
Egyptian. (*See* Berseem.)
hay, feeding value, Ohio, 879.
hay v. alfalfa for cattle, Wis., 466.
leaf spot, studies, 849.
mites and chiggers, Ohio, 899.
mosaic, protozoa associated with, 646.
mosaic, temperature studies, 646.
red, artificial self-pollination, 229.
red, foreign, seed behavior, Wis., 432.
red, optimum soil reaction for, 320.
red, pasture, N.C., 776.
red, pollination, fertilization, and breeding, 836.
red, variety tests, Can., 530.
seed production, Can., 530.
seeding experiments, Can., 530; Ind., 431.
solar energy used by, 508.
sweet. (*See* Sweet clover.)
white, variation in, 228.
Clover—Continued.
white, variety tests, Can., 530.
winter injury, Ga., 231.
Coal fields of Virginia, forests of, 145.
Coal-tar pitch for waterproofing and damp proofing, master specification, 389.
Cobalt, occurrence and function, 310.
Coccidae—
classification, 359.
notes, 652.
of Egypt, studies, 53, 653.
of Palestine, 157.
Coccidiosis—
and coccidia of rabbits, 280, 587.
in chicks, control, 786; Calif., 477.
in fowls, Ohio, 798.
Coccidium—
of rabbit, effect of acridine, 889.
rat, morphology and biology, 280.
Coccids—
case of association of, 652.
from Japan, descriptions and biology, 157.
Coccomyces hiemalis, notes, Mich., 448.
Coccophagus—
lecanii, life history and bionomics, 160.
spp., notes, Calif., 449.
Cockerel, keelless, 331.
Coconut—
bud rot, description, 549.
bud rot, studies, 49.
diseases and pests, 153.
diseases, notes, 148.
mealybug, control, 653.
moth, parasite of, 257.
palms, variation in yield, 242.
Coconuts—
premature leaf and nut fall, 147, 250.
purple leaf moth affecting, 859.
Cod liver oil—
chemistry of, effect of hydrogenation, 765.
color reactions of, 810.
concentrate, clinical experience, 767.
injected, growth-promoting and antirachitic value, 265.
oxidised, value, 661.
therapeutic uses, 661.
value for chicks, Can., 875.
value for egg production, 670.
vitamin potency, 664.
Codling moth—
control, 856; Mo., 451.
control, arsenical requirements for, 360.
control in New Jersey, 253.
egg parasite, 861.
in British Columbia, 155.
in walnuts, control, 858.
notes, N.C., 755.
ovicides, notes, 154.
papers on, 154.
Coffee—
berry borer, bionomic data, 759.
berry disease, 147, 246.
black rot or koleroga in Mysore, 152.
diseases in Africa, 152.

Coffee—Continued.
  diseases, notes, 147.
  industry of Kenya Colony, 844.
  monograph, 644.
  pink disease, notes, 147.
Colleges. (*See* Agricultural colleges.)
Colletotrichum—
  coffeanum, notes, 147.
  gossypii, notes, S.C., 750.
  sp., notes, 152.
  tabificum, notes, 641.
Colloid chemistry—
  foundations, treatise, 802.
  of the protoplasm, treatise, 309.
Colloidal—
  clay, chemical nature, 816.
  sulfur, fungicidal value, 847.
  sulfur, preparation, 452.
Colloids—
  effect on physical properties of soils, 816.
  in sugar manufacture, 613.
  soil, and tillage, 589.
  soil, climatic agencies in relation to, 719.
  soil, estimating, 319.
  soil, heat of wetting, factors affecting, 817.
  soil, studies, 510.
Colocasia corm rot, 43.
Color—
  genes, activating, in albinos, 526.
  inheritance in cattle, 128.
  inheritance in sheep, 228.
  knowledge essential to costume, Mo., 496.
Coloradia pandora, notes, 857.
Colorado—
  River basin, bill for protection and development, 587.
  Station, report, 194.
Coloring matter from tar, fungicidal action, 148.
Coloring matter, use in food, 160.
Colors and varnishes, treatise, 891.
Colostrum—
  fat of, chemical and physical constants, 203.
  in milk, law governing changes, 380.
  ingestion, effect on newborn calf, 571.
  studies, 203.
  value in disease prevention, 785.
Colts, draft, feeding, Mo., 470.
Community clubs, constitution and by-laws for, 695.
Compost rotation experiment, La., 514.
Concrete—
  blocks, L-shaped, Iowa, 788.
  broken stone, permeability tests, 185.
  cinder, nail-holding power, 483.
  consistency, new test for, U.S.D.A., 789.
  curing with calcium chloride, U.S.D.A., 84.
  disintegration, cause, 590.
  effect of moisture, U.S.D.A., 84.
Concrete—Continued.
  feeding floor, value for pigs, Kans., 371.
  pavement, hair cracks in, tar paper for, U.S.D.A., 790.
  reinforced, design, 284.
  roads, cracks in, U.S.D.A., 789.
  roads, strength of cores drilled from, effect of capping, U.S.D.A., 284.
Conifers—
  exotic, in Sweden, hardiness, 644.
  natural regeneration, insolation as factor, 539.
  nuclear degeneration in wood, 423.
  seedling, inoculation with damping-off fungi, 356.
  seedling, key to identification, 41.
Coniosporium gecevi, notes, Iowa, 749.
Coniothyrium diplodiella—
  on grape in Japan, 151.
  studies, 250.
Coniothyrium fruit spot, notes, 547.
Connecticut—
  State Station—
    notes, 697.
    report, 96.
    report of director, 496.
    semicentennial, editorial, 601.
  Storrs Station, report, 299.
Conotrachelus—
  nenuphar. (*See* Plum curculio.)
  seniculus, studies, 159.
Convolvulus arvensis in grain seed, 36.
Cooperation—
  Community Settlement, and Credit Act in New South Wales, 297.
  papers on, 598.
  (*See also Agricultural cooperation.*)
Cooperative societies—
  in New South Wales, organization, 297.
  organization, 392.
  work in devastated regions of France, 94.
Cooperia bisonis, new nematode from buffalo, 553.
Copper—
  association with vitamin A, 864.
  chronic poisoning, relation to hemochromatosis, 267.
  hydroxide as substitute for Bordeaux, 241.
  in milk, relation to vitamin potency, 580.
  in tissues, estimation, 206.
  occurrence and function, 810.
  plating, solution by milk and whey, 277.
  relation to *disease among* Koreans, 659.
  sulfate, fertilizing value, 517.
  sulfate toxicity to *Tilletia tritici* spores, 542.
  toxicity for fungi, 542.
Copra meal—
  as supplement to camote vines for pigs, 576.
  value for hens, 577.

Corn—
absorption of aluminum and iron by, 247.
and beet tops pasture for lambs, U.S.D.A., 370.
and products, nutritive value, bibliography, Ill., 168.
and products, uses, U.S.D.A., 614.
and soy beans, culture, Miss., 131.
and soy beans, culture experiments, Minn., 130.
and soy beans, hogging down, Minn., 170; Mo., 70.
and tankage v. barley and tankage, feeding value, Minn., 171.
and tankage v. corn, feeding value, Minn., 171.
as supplement to camote vines for pigs, 575.
Belt, agricultural readjustment in, 896.
borer, European—
behavior, 361.
decrease in infestation in New England, 653.
in America, 256.
in Connecticut, Conn.State, 450.
in New England, winter mortality in, 256.
infestation, relation to date of corn planting, Ohio, 556.
lepidopterous larvae resembling, 559.
life history and habits, N.H., 451.
overwintering larvae, destruction by birds, 757.
status in 1924, 361.
summary, 51.
breeding, 230; Conn.State, 434.
chlorophyll characters in, inheritance, 229.
chlorophyll defects in, 29.
chlorophyll deficiencies, frequency of appearance, 226.
chlorophyll in maternal inheritance, 229.
chromosome numbers in, 523.
composition, effect of soil temperature and moisture, 748.
cost of production, U.S.D.A., 489.
crosses, inheritance of chemical characters, Iowa, 730.
cultivation, Ill., 32.
cultural methods, Okla., 31.
culture, Ariz., 433.
culture experiments, Miss., 231; U.S.D.A., 132, 333.
culture in Red River Valley, Minn., 136.
degerminated, feeding value, Ind., 173.
digestibility for pigs, 373.
dry rot, Iowa, 749.
dry rots, control, 544.
effect of continuous selection for ear type, U.S.D.A., 330.
factor essential for reproduction in, 62.
feeding value, Can., 573.
Corn—Continued.
fertilizer experiments, Can., 530; La., 514; Miss., 131, 333; Mo., 431; N.C., 735; Ohio, 735.
fertilizer experiments, triangular, Ga., 230.
flakes, irradiated, effect, 568.
genetic analysis, Mo., 426.
germ meal, feeding value, Wis., 470.
growing enterprise, management, analysis, 495.
growth, relation to environment, 134.
growth relation to seed weight, N.J., 23.
heritable characters, 29.
hog ratio in Ohio, Ohio, 895.
hogging down, 870; Iowa, 774; Ohio, 575; U.S.D.A., 372, 373.
hogging down, mineral mixture as supplement, 571.
improvement, N.C., 735.
inbred strains, homozygosity in, 128.
inbred strains, production, Conn.State, 629.
inherited chlorotic types, 128.
irradiated, effect, 568.
kernel, polypeptides and amino acids in, 502.
leaf aphid, mosaic transmission by, 147, 649.
leaf blight, studies, 348.
lodging, factors affecting, Ill., 434, 444.
manuring experiments, Minn., 119; U.S.D.A., 334.
market, London, historical account, 594.
meal, digestibility for pigs, 373.
New England, waxy endosperm in, 29.
origin, 837.
plant, feeding value, N.C., 770.
planting tests, Ohio, 529.
polkadot leaves, inheritance of, 29.
prices, relation to transportation costs, 593.
production in Montana, extension type, Mont., 186.
production, motorising in Ohio, 688.
productiveness, relation to seed-ear characters, U.S.D.A., 32.
removal of suckers, 233.
root rot, reducing by seed selection, 247.
root, stalk, and ear rot, studies, 850.
roots, penetration and water level in peat soil, 18.
rotation and tillage experiments, U.S.D.A., 528.
rotation experiments, Wyo., 133.
rots, causes and control, Ill., 849.
seed, curing, Wis., 443.
seed, diseases in, Ill., 850.
seed, effects of high temperatures, 623.
seed, fungi infecting, La., 850.
seed, selection based on ear characters, 233.

Corn—Continued.
seeding experiments, Can., 530; Minn., 130; Nebr., 483.
seedling blight, factors affecting, 748.
seedlings, Diplodia infection, effect of environment, 850.
seedlings, effect of plant protectors, Mich., 341.
silage. (*See* Silage.)
silage merits, U.S.D.A., 132, 334.
smut infection, studies, Iowa, 740.
smut, life history and ecologic relations, 349.
spacing experiments, 527.
stover as fertilizer, Minn., 119.
sweet. (*See* Sweet corn.)
Teopod, inheritance of, 29.
tolerance for alkali, 320.
v. barley for pigs, Can., 871, 872.
v. sorghum as forage crop, Nebr., 483.
variegation in, Mo., 426.
varieties, Mo., 431; U.S.D.A., 132.
varieties for Kansas, 528.
varieties, forage value, U.S.D.A., 132.
variety tests, Ariz., 733; Can., 530; Ga., 230; Ind., 130, 431; La., 528; Minn., 130, 131; Miss., 131; N.C., 734; N.Dak., 334, 529; N.Mex., 131; U.S.D.A., 528, 834; Wis., 432; Wyo., 133.
white, feeding value, 571.
yellow v. white, for poultry, Okla., 174.
Cornell University, notes, 197, 697.
Cornstalk borer, notes, 559.
Cornstalks, infested, burning, Ohio, 599.
Cornstarch—
gelatinization temperatures, 410.
irradiated, effect, 568.
Corpora lutea—
extracts and ovulation in rabbits, 833.
human, secretion of follicular hormone, 834.
of oestrous cycle in cows, 631.
Corticium—
koleroga, notes, 152.
salmonicolor, notes, 147, 148, 153.
vagum, notes, N.Y.Cornell, 44.
Coryneum beijerinckii, notes, 43.
Cosmopolites sordidus. (*See* Banana rootborer.)
Cosmos bacterial wilt, 153.
Cost of living—
in farming communities, 297.
on Iowa farms, Iowa, 797.
Cost of production. (*See specific crops.*)
Cotton—
acreage, forecasting, 592.
American upland, taxonomy, 337.
anthracnose, control, N.C., 747, 847.
areolate mildew, notes, 148.
belt, black land, farm survey, Tex., 893.
black arm disease, Ariz., 745.
blooming, boll formation and dehiscence, 136.
boll anthracnose, notes, 148.
Cotton—Continued.
boll shedding, Okla., 150.
boll studies, La., 528.
boll weevil. (*See* Boll weevil.)
bollworm. (*See* Bollworm.)
breeding experiments, Okla., 133.
cellulose, chemistry and technology, 412.
cellulose, swelling, 312.
chemical products, 718.
Committee, Indian Central, activities, 137.
cost of production, U.S.D.A., 489.
crinkle and soil moisture constants, 335.
cultivation tests, Okla., 133.
culture experiments, Miss., 231.
culture in Egypt and Sudan, relation to climate, 112.
culture in St. Vincent, 336.
culture in United States, 137.
culture on southwestern irrigation projects, 136.
diseases in West Africa, 350.
elastic properties, effect of humidity, 33.
electrification in, 634.
export shipments, routing, 295.
factors inhibiting development, 335.
fertilizer experiments, 218; Ariz., 733; Ark., 435; Ga., 230; La., 514, 528; Miss., 33, 131, 136, 231, 234, 333; Mo., 234.
fertilizer experiments, triangular, Ga., 230.
fibers, estimating, Balls sledge sorter for, 337.
fibers, stress strain relationships, 33.
fibers, studies, N.C., 736.
flowering curves, calculating formulas, 837.
hair, weights and measures, 737.
handling, avoidable losses in, U.S.D.A., 293.
hybrid, Asiatic and American, 129.
improvement, N.C., 735, 835.
improvement in Nigeria, 335.
in South Africa, 736.
industry, relation to research, 530.
inheritance of seed and lint characters, 331.
leaf and stem feeding beetle, 258.
lint length, statistical analysis, 337.
linters, American, official standards for, U.S.D.A., 634.
long and short staple, yields, Ariz., 734.
marketing for export, 293.
mercerisation, 531.
pests, control in north India, 554.
Pima, ginning in Arizona, U.S.D.A., 234.
plant, alkaline reaction, 150.
plant, effect of water, 837.
plant lint hairs, function, 633.
plant reaction, 626.

Cotton—Continued.
planting date experiments for weevil control, U.S.D.A., 336.
planting experiments, Ariz., 733.
potash and phosphorus requirements, Ga., 230.
production in British Empire, 530, 532.
rain-grown, and climate, 14.
ratooned Queensland, quality, 137.
relation to temperature and rainfall, 317.
seed, anthracnose infection in, S.C., 750.
seed, effects of heat treatment, 234.
seed treatment against pink bollworm, 55.
(*See also* Cottonseed.)
shoot die-back, notes, 148.
spacing and time of planting tests, Miss., 33.
spacing experiments, 527; Ga., 230; Miss., 131; N.C., 835.
stainer, African, notes, 254.
studies, N.C., 736.
survey of Salt River Valley, Ariz., 234.
topping test, Ariz., 733.
used in mail bags, wearing qualities, 737.
varieties, Miss., 33, 234; Mo., 234; Okla., 133.
variety tests, Ariz., 733; Ga., 230; La., 528; Miss., 131, 332; N.Mex., 131; Okla., 435.
wilt in India, 247, 350.
wilt, notes, 44.
yield, relation to weather, 813.
Cottonseed—
meal, feeding value, Ariz., 769; N.C., 770; Va., 578.
meal, value for egg production, Mo., 471.
oil, crude, constituents, 9.
oil export shipments, routing, 295.
Cottonwoods, oyster-shell scale affecting, Colo., 154.
Councilmania lafleuri, notes, 553.
Country and town, service relations, Wis., 487.
(*See also* Rural.)
Court-noué, cause, 354.
Cover crops—
orchard, function and value, Mich., 536.
value for pecans, 538.
winter, for citrus orchards, Calif., 242.
Cow—
blood, bactericidal properties, Mo., 479.
houses, construction, 390.
manure, plant foods recoverable from, 790.
Cow—Continued.
testing associations in Virginia, operation, 380.
testing associations, organization and results, U.S.D.A., 676.
Cowpeas—
green, effect on flavor and odor of milk, U.S.D.A., 879.
spacing experiments, 230.
sunburn and aphid injury, Ariz., 746.
v. soy beans for seed and hay, Mo., 431.
variety tests, 133; Wyo., 133.
Cows—
age, relation to milk production, 176.
beef, feeding experiments, W.Va., 770.
changes in reproductive organs following parturition, 385.
conformation relation to milk yield, 781.
feeding experiments, Ind., 175; Kans., 377.
genital organs, diseases of, 680.
grain requirement, Ohio, 798.
milk production. (*See* Milk production.)
protection from flies, Okla., 155.
range, supplemental feeding, N.Mex., 369.
rations for, Okla., 66.
rations for, computing, 473.
sterility in, 278.
(*See also* Calves, Cattle, *and* Heifers.)
Crab apples, varieties in Wyoming, 536.
Crambus hortuellus. (*See* Cranberry girdler.)
Cranberry—
girdler, control by submerging, N.J., 256.
insects, studies, 555.
production, effect of height of water table, 143.
Cream—
acid, neutralizing, Wis., 475.
cooling, for butter making, Ind., 177.
effect of pasteurization temperature and neutralization on butter, 178.
enzymes in, effect of heat, 882.
factory treatment for butter making, Mich., 781.
handling, effect on grade, 474.
irradiated, effect, 568.
neutralization for butter making, 581.
of wheat, irradiated, effect, 568.
pasteurization, papers on, 580.
pH values, measurement, 12.
plug, cause and prevention, Wis., 475.
Creameries—
Minnesota, statistics, 277.
operating costs, Wis., 487.
organization, economic aspects, Minn., 489.
Creamery waste purification, 86.
Creatine metabolism in experimental scurvy, 164.
Creeping plants, studies, 628.
Cremastus sp., notes, U.S.D.A., 54.

Crepis capillaris, varietal studies, Calif., 425.
Cresol, crude, m-cresol in, 506.
Cricket, coulee, notes, 756.
Crickets, destruction, 52.
Cronartium—
occidentale and *C. ribicola*, differences, 347, 651.
ribicola. (*See* White pine blister rust.)
Crop—
conditions on Belle Fourche Project, U.S.D.A., 390.
growth and soil reaction, 320.
production, chemistry, 16.
production in India, treatise, 335.
report regulations, U.S.D.A., 92.
reports, U.S.D.A., 92, 392, 491, 691, 794.
rotations. (*See* Rotation of crops.)
yields on large estates in Hungary, 796.
Crops—
and Markets, monthly supplement, U.S.D.A., 92, 392, 488, 691, 794.
and weather conditions, Minn., 113.
cost of production, U.S.D.A., 489.
forecasting in India, 192.
form of nitrogen for, 20.
hogging down value, N.C., 775.
on peat or muck land, cultivation, 589.
response to potassium salts, 724.
spacing experiments, 527.
(*See also* Field crops *and specific crops.*)
Crown gall—
organism, location in host tissues, 645.
organism, morphological responses of host tissues, 645.
resistance, experiments with Paris daisy and rose, 655.
studies, Iowa, 747; Wis., 443.
Crows, economic status and control, Okla., 155.
Crucifer white rust hosts and control, 544.
Crude fiber. (*See* Cellulose.)
Cryptotermes brevis, notes, 156.
Cryptothrips floridensis. (*See* Camphor thrips.)
Crystalline substance with properties of bios, isolation, 204.
Cucumber—
angular leaf spot, notes, 43.
beetle, striped, notes, Iowa, 755.
beetles, striped and spotted, control, Mo., 450.
cottony leak, description, 851.
downy mildew, notes, 48.
seed, germination studies, Colo., 146.
soils, sterilization, 640.
Cucumbers, culture, treatise, 640.
Culex quinquefasciatus and dengue fever, 854.
Culicid observations, 652.
Culicoides, review, 860.
Curinus coeruleus, notes, 653.
Currants—
black, reliability of variety tests, 643.
culture, 343; Mo., 241.
taxonomic study, N.Y.State, 424.
Current meters, rating apparatus, 682.
Cut-over lands, farming, Idaho, 511, 514, 599.
Cutworms—
damage from, N.C., 755.
sodium fluoride as bait for, 256.
Cyanide C dust, tests for cucumber beetle, Mo., 450.
(*See also* Hydrocyanic acid.)
Cyathostoma spp., notes, 553.
Cylas formicarius. (*See* Sweet potato weevil.)
Cylinder and engine lubrication, 685.
Cylindroma, notes, 279.
Cynodon dactylon as weed in Belgian Kongo, 839.
Cyperus—
difformis, control, 133.
rotundus, eradication, 688.
Cyphella sp., notes, 153.
Cypress moth, notes, 158.
Cysteine, oxidation, in animal body, 59.
Cystine—
oxidation, in animal body, 59.
rôle in nutrition of rats, 562.
Cystopus candidus, notes, 544.
Cytokinesis, meiotic, of Cannabis, 27.
Cytospora chrysosperma, notes, 43.
Dacus oleae in Palestine, 654.
Daedalea confragosa, growth reaction toward acidity, 224.
Daffodil names, classified list, 845.
Dahlias, culture, treatise, 242.
Dairy—
analysis, laboratory manual, 808.
barns and equipment, Iowa, 390.
barns for Nebraska, 86.
barns, ventilation, 580.
cows. (*See* Cows.)
electric sterilizer for, 590.
engineering, treatise, 791.
farming, economic studies, N.Y.Cornell, 891.
farming on arable land, 675.
herd, selecting foundation cows, Ohio, 781.
practices on general farms, Mich., 798.
products—
examination, Mojonnier tester, 505.
fat determination in, 315.
fat determination in, methods, Conn.Storrs, 808.
manufacture, Okla., 177.
production in Canada, 178.
sires. (*See* Bulls *and* Sires.)
wastes, purification, 86.
Dairying—
in New Zealand and Wisconsin, 893.
research in, 174.
(*See also* Creamery, Butter, Milk, *etc.*)
Dalrymple, W. H., biographical notes, 196.

Danysz virus for control of voles, 551.
Darso, nutritional value, Okla., 66.
Dasymutilla permista, notes, 57.
Date—
palm scale, control, Ariz., 757.
palms, spraying, Ariz., 745.
pollen, viability, 344.
Dates, varieties, Ariz., 740.
Datura—
chromosome studies, 226, 227, 328.
mutants, behavior of chromosomes in, 328.
reduction division in, 227.
Datura stramonium tetraploid, inheritance in, 227.
Deficiency diseases. (*See* Diet deficiency.)
Delaware Station, notes, 498.
Delphax as rice pest, 857.
Dendroctonus—
piceaperda. (*See* Spruce beetle, eastern.)
spp. (*See* Pine beetles.)
Dendrographic measurements, 517.
Dengue fever, transmission experiments, 654.
Denitrification—
effect of reaction of medium, 512.
effect of temperature, 817.
Department of Agriculture. (*See* United States Department of Agriculture.)
Depressaria heracliana. (*See* Parsnip webworm.)
Dermacentroxenus rickettsi, notes, 552.
Derris as an insecticide, tests, 52.
Desert—
Egyptian, bioclimatic study in, 317.
plants, seasonal changes in water relations, 823.
watering places in Arizona, 890.
Dewberries—
culture, Mo., 241.
spraying, Mich., 354.
Dewberry anthracnose—
control, Mich., 354.
notes, N.C., 747, 847.
Dextrin reserve in monocotyledons, 519.
Dextrose, manufacture and uses, 111.
Diabase, formation of soil from, 616.
Diabetes—
action and use of insulin in, 462.
dietary management, simplified method, 569.
dietary treatment, 368.
in children, treatment, 663.
meal unit diet in, 868.
muscular exercise in, 868.
new method in, treatise, 266.
status, 868.
thrice-cooked vegetables for, 768; Mo., 462.
use of intarvin in, 569.
Diabetic—
diet calculation, rotary nomogram for, 364.
diets, 65, 266.
Diabrotica—
tricincta, injury to truck crops, 159.
vittata. (*See* Cucumber beetle, striped.)
Diaprepes spengleri on sugar cane, control, 860.
Diarrhea, bacillary white—
agglutination tests, 82.
control, Mass., 889.
effects, Mich., 787.
in chicks, 279, 889; Minn., 477.
studies, 681.
testing chickens for, 280.
Diastase, effect of pH, 714.
Diatraea saccharalis. (*See* Sugar cane borer.)
Diatraea zeacolella. (*See* Corn-stalk borer.)
Dibrachys—
affinis, biology, 760.
boucheanus, notes, 652.
Dicaelotus erythrostoma, biology, 656.
Dictyocaulus hadweni from lungs of buffalo, 553.
Dicyanodiamide—
determination, 805.
toxicity studies, 521.
Diet—
accessory factors. (*See* Vitamins.)
calorie value, rotary nomogram for calculating, 364.
deficiency, ophthalmia as symptom, 63.
deficiency, relation to gastric lesions in rats, 165.
of children. (*See* Children.)
of infants. (*See* Infants.)
parents', effect on young, 262, 563.
(*See also* Food and Nutrition.)
Dietetics for nurses, treatise, 450.
Diets—
diabetic, 65, 266, 364.
protein-rich, effects, 863.
synthetic, rearing rats on, Mo., 464.
Diphtheria—
avian, notes, 279.
avian, studies, 81.
immunity to, 677.
toxin, resistance of avitaminic rats to, 381.
vaccination against, 785.
Diplococcus pneumonia capsulatus, notes, N.C., 889.
Diplodia—
natalensis, nitrogen metabolism of, 122.
tubericola, studies, 758.
zeae infection, effect of environment, 850.
zeae, notes, 544, 850, 851; Ill., 851; La., 850.
Dips for livestock, sale in South Africa, 278.
Diptera, leaf-mining, of North America, N.Y.Cornell, 55.
Dipterous parasites, biology of, 55.
Diseases—
deficiency. (*See* Diet deficiency diseases.)
human, and iron deficiency, 161.

Diseases—Continued.
of Animals Acts, proceedings under, 380.
of animals. (See Animal diseases and specific diseases.)
of plants. (See Plant diseases and specific host plants.)
Disinfectants for foulbrood, tests, 655, 860.
Dodder, notes, U.S.D.A., 334.
Dogfish liver oil, vitamin A in, 864.
Dogs—
blood pressure of, 482.
cuterebrid larvae in, U.S.D.A., 482.
effect of parathyroid hormone, 564.
parasites and parasitic diseases, U.S.D.A., 482.
preventive antirabic vaccination, 79.
Domestic science. (See Home economics.)
Dough, yeast cells in, counting, 109.
Douglas fir oleoresins, composition, 811.
Drainage—
canals in Finland, factors affecting condition, 282.
control in muck land, Mich., 387.
ditch, Tempe, variations in composition of water, Ariz., 789.
experiments, N.C., 890.
loss of nitrogen in, 723.
studies at Aberdeen, 213.
Dried blood, nitrogen availability under varying conditions, 619.
Drinking habit in a family, inheritance of, 29.
Drinking water for poultry, purification, 681.
Drosophila ampelophila. (See Pomace fly.)
Drought—
effect on plants, 423.
resistance in plants, studies, 518.
Drug plants, characters, 225.
Drugs, botanical, treatise, 9.
Dry farming—
at Belle Fourche, U.S.D.A., 235.
in Sulphur Spring Valley, Ariz., 433.
in western Kansas, U.S.D.A., 88.
Drying oven, diagram, Wis., 408.
Drymaria glauca poisonous to cattle, N.Mex., 179.
Dryopeta hirsuta, life history and control, 359.
Dust—
for citrus groves, use and abuse, 856.
industrial, problem, 590.
road, physical characteristics, 483.
Dusting—
machine for wheat smut, 486.
v. spraying, Conn.State, 450.
(See also Spraying and specific crops.)
Duty of water. (See Irrigation.)
Dyes, adsorption by soils, 617.
Dynamiting, subsoil, experiments, Ill., 17.
Dysdercus superstitiosus, notes, 254.
Ear canker—
in rabbits, cure and prevention, 82.
in rabbits, treatment, 587.
Ear tick, spinose, summary, 657.
Earias spp. in French West Africa, 361.
Earth—
fills, vertical pressure, measurement, U.S.D.A., 83.
pressure against abutment walls, measurement, U.S.D.A., 684.
Earwig, European, in British Columbia, 254.
Earwigs, habits, 254.
East coast fever. (See African coast fever.)
Eberthella sanguinaria, notes, N.C., 786, 889.
Echinochloa colona, transmission of mosaic disease to, 156.
Echinospermum lappula in grain seed, 36.
Echinostomidae, life history, 357.
Ecological factors, relation to pH of soil, 125.
Economic—
and commercial resources of Italy, 596.
and social conditions in South Carolina, Fairfield Co., 797.
and social study of Tennessee, 494.
history, American, treatise, 393.
history of Tudor period in England, treatise, 93.
status of China, changing factors in, 596.
Economics, rural. (See Rural economics.)
Edema—
in South African cattle, 385.
malignant, immunization, 78.
of the wattles, 279.
Edinburgh and East of Scotland College of Agriculture Experimental Farm, opening, 200.
Education—
adult, in Scandinavia and America, treatise, 94.
agricultural. (See Agricultural education.)
Egg albumin. (See Albumin, egg.)
Egg production—
and body weight, N.J., 877.
and hatchability, effect of rations, Ohio, 873.
annual, relation to sexual maturity, Mo., 471.
effect of artificial light, Iowa, 778; N.C., 779.
effect of latitude, N.C., 779.
effect of molt, Iowa, 778.
effect of proteins, Mo., 71.
effect of ultraviolet light, 274.
feeding for, N.J., 472; Ohio, 577.
genetic factors in, 382.
mineral requirements, 273.
of pullets v. hens, Can., 875.
relation to time laying starts, Mo., 472.
relation to time of hatching, Mo., 472.
sources of protein for, Can., 875.
winter, Mich., 876.
winter, effect of artificial light, Ind., 178.
winter, feeding for, Can., 875.
winter, requirements for, Minn., 174.
(See also Hens, laying.)

Egg yolk, irradiated, effect, 588.
Egg yolks, olive-colored, cause, 274.
Egg-laying contest—
 Maryland, rules and regulations, Md., 877.
 Utah intermountain, rules and regulations, Utah, 877.
Eggplant—
 root rot, notes, 43.
 wilt, notes, 248.
Eggs—
 antiscorbutic properties, 768.
 data for consumers, 376.
 dipping in chemicals, effect on hatchability, 670.
 dirty, effect of washing on keeping quality, 669.
 fertilization, time required for, 671.
 hatchability, effect of chilling, 273.
 hatchability, effect of low temperature, 670.
 hatchability, relation to calcium supply of hens, 577.
 incubation. (*See* Incubation.)
 market, quality in, N.J., 877.
 of pullets v. hens for hatching, Can., 874, 875.
 phosphorus in, 807.
 preservation by freezing, 260.
 preserved, stability of vitamins in, 459.
 storing for winter, Can., 875.
 transmission of avian tuberculosis through, 384.
 vitamin B in, 570.
 White Leghorn, variation in weight, W.Va., 671.
Eggshells, sources of lime for, Ohio, 874.
Eimeria—
 intricata from sheep, description, 888.
 nieschulzi n.sp., morphology and biology, 280.
 spp. in rabbits, 280.
 stiedae, effect of acridine, 889.
Elasticity, applied, treatise, 386.
Electric—
 lighting plant propelled by wind, Ind., 184.
 plowing, 389.
 power for orchard spraying, 486.
 service, calculating rural extensions, 686.
 sterilizer for average-sized dairy, 590.
 transmission lines, construction, operation, and maintenance, 686.
 washing machines, 486.
Electrical—
 dictionary, standard, 686.
 installations, defective, in farm buildings, 891.
Electricity—
 agricultural uses, in Pennsylvania, 486.
 application to agriculture, 85.
 application to agriculture in Europe, 389.
 application to smaller rural industries, 389.
 effect on plant cells, 823.
Electricity—Continued.
 effect on plant growth, 222.
 from farm light plants, cost, Mo., 482.
 in Oregon agriculture, 891.
 in rural districts of France, 486.
 production by wind power, 891.
 rural distribution, cost, 485.
Electrodes for moisture determinations, standardization values, 116.
Electrogenetic laboratory at Belgirate, work in, 329.
Eleocharis capitata, control, 133.
Elevating grader—
 costs, U.S.D.A., 483.
 wagon combination, operation, U.S.D.A., 284.
Elionurus wombaliensis as weed in Belgian Kongo, 839.
Elm leaf beetle in California, 159.
Elm-currant aphis, life history and control, 858.
Elytranthe—
 globosa, notes, 153.
 spp., notes, 148.
Emmer, variety tests, U.S.D.A., 134.
Emphysema in calves, acute alveolar, 279.
Empire Cotton Growing Corporation, activities, 532.
Encarsia formosa n.sp., description, 561.
Encephalitozoon cuniculi as kidney parasite in rabbits, 889.
Encyrtinae, new genera and species, 160.
Endamoeba spp., notes, 553.
Endocrine—
 diseases, diagnosis and treatment, treatise, 266.
 glands, relation to metabolism, 462.
 organs, grafting on animals, 167.
Endocrines, chromosomes, and heredity, 627.
Endolimax nana, notes, 553.
Energy—
 expenditures of Yale oarsmen, 863.
 yield in biological reactions, 827.
Engine oil, used, foreign material in, 485.
Engineering—
 agricultural, extension work in, U.S.D.A., 599.
 agriculture, papers on, 399.
 agricultural, studies, Mo., 482.
 colleges, cooperation with state and municipal departments, 598.
 dairy, treatise, 791.
 highway, treatise, 589.
 materials, resistance of, 684.
 structural, fundamental properties of materials, 284.
 structural, handbook, 388.
Engines—
 gas and gasoline. (*See* Engines, internal-combustion.)
 internal-combustion—
  air cleaner tests, 485.
  air consumption relation to brake horse power, 286.
  heat loss in, 85.
  lubrication and cylinder, 685.

Engines—Continued.
internal-combustion—continued.
missing pressure in, 84.
starting, 685.
Engleromyces goetzei, notes, 246.
Entedon pharnus, notes, 259.
Enterohepatitis, infectious. (*See* Blackhead.)
Entomology—
applied, in Canada, 358.
common names used in, 553.
Hawaiian, early references, 554.
introduction to, treatise, 252.
textbook, 651.
(*See also* Insects.)
Entomophthora sphaerosperma, notes, 756.
Environment—
and heredity, 430.
organic adaptation to, treatise, 27.
Enzyme, milk-coagulating, of *Solanum elaeagnifolium*, 324.
Enzymes—
chemical investigations, 408.
hydrolyzing, 8.
in bacterial spores, 25.
of blood in experimental scurvy, 165.
of intestinal contents, effect of food intake, 457.
proteolytic, effect of heat, 882.
proteolytic, of flour, effect, 311.
use in beet sugar factory control, 811.
Ephialtes, oviposition, 652.
Epiblema spp., notes, 559.
Epicauta. (*See* Blister beetles.)
Epilachna corrupta. (*See* Bean beetle, Mexican.)
Epischnia parkerella, notes, Mont., 51.
Epiurus indagator, notes, 652.
Erannis tiliaria. (See Lime tree looper.)
Eriophyes—
gracilis, description, 561.
pini, notes, 861
Eriosoma—
lanigerum. (*See* Apple aphid, woolly.)
ulmi, life history and control, 858.
Ernestia rudis, notes, 53.
Erosion and deposition measurements, 823.
Erythrina twig borer, notes, 654.
Erythrocytes and action of hemolysins, treatise, 278.
Ethyl acetate-carbon tetrachloride mixture as fumigant, 453.
Eucalyptus snout beetle, studies, 56.
Eudemis moth, parasite of, 656, 760.
Eulia velutinana, summary, 558.
Eumerus strigatus, life history notes, 361.
Eupelmus—
coccidivorus n.sp., description, 561.
inyoensis, notes, 260.
Euplectrus platyhypenae, notes, 653.
Euproctis—
chrysorrhoea. (*See* Brown-tail moth.)
irrorata, notes, 558.
Eupteromalus cognatus n.sp., description, 561.
Eurytoma—
appendigaster, oviposition and feeding, 560.
curculionum, notes, 259.
orchidearum, life history and control, 362.
Eusemion californicum n.sp., notes, 260.
Eutettix tenella. (*See* Beet leafhopper.)
Eutreta xanthochaeta n.sp., description, 654.
Euxoa. (*See* Cutworms.)
Euzenilliopsis diatraea, notes, 155.
Evaporation, laboratory studies, Colo., 185.
Evolution—
and geographical distribution, statistics, 225.
processes causing, treatise, 328.
treatise, 225.
Ewes—
pregnant, mineral balances of, Ohio, 574.
range, feeding and finishing, Nev., 467.
salt consumption, Iowa, 773.
(*See also* Sheep.)
Exoristia pyste, notes, U.S.D.A., 54.
Experiment—
station leadership, 598.
station projects, classified list, U.S.D.A., 798.
Station Record abbreviations of periodicals, U.S.D.A., 599.
station system, editorial, 301.
stations, organization list, U.S.D.A., 298.
stations, work and expenditures, U.S.D.A., 696.
(*See also* Alabama, Arizona, *etc.*)
Explosives, use on the farm, 84, 891.
Extension work in foods and nutrition, U.S.D.A., 899.
(*See also* Agricultural extension.)
Fairfield County, S.C., economic and social conditions, 797.
Fallopian tube contraction, effect of ovarian extracts, 526.
Family—
budgets of farm workers in England, 692.
living from the farm, U.S.D.A., 897.
system economy in agriculture, treatise, 297.
Fans, value in furnace heating, 590.
Farcy. (*See* Glanders.)
Farm—
accounting—
double entry, Iowa, 89.
in Denmark, 392.
manual, 190.
on Iwerne Minister Home Farm, 688.
textbook, 95.
textbook, blank books for, 194.
animals. (*See* Livestock and Animals.)
credit. (*See* Agricultural credit.)

Farm—Continued.
forestry, extension program, U.S.D.A., 695.
holdings, peasant, in Denmark, cropping systems, 596.
investment in Nebraska, Nebr., 189.
labor. (*See* Agricultural labor.)
land income relation to value, 189.
land, terracing, 387.
lands, taxation, 490.
machinery. (*See* Agricultural machinery.)
management on dairy farms in New York, 892.
management, relation to cattle feeding, Ill., 88.
mechanics handbook for farmers, 84.
mortgage interest rates, 689.
mortgage investments, 794.
organization and management, Iowa, 687.
ownership, economic aspects, U.S.D.A., 488.
ownership in United States, 793.
pond, dam and spillway for, 83.
prices, types of index numbers, 92.
products. (*See* Agricultural products.)
profits, Okla., 89.
profits and losses, 688.
shop work, treatise, 186.
structures, papers on, 399.
survey of black land cotton belt, Tex., 893.
tenancy disputes adjustment in Japan, 794.
tenancy in United States, 591, 793.
(*See also* Land tenancy *and* Land tenure.)
village, Mormon, social survey, 797.
woman, American, treatise, 297.
zone, treatise, 797.
Farmers—
American, economic position, 189.
double entry accounts for, Iowa, 89.
financial policy for, 90.
incomes and standards of living, 897.
Farmers'—
church, treatise, 797.
cooperative associations in United States, 297.
movements in Canada, history, 895.
shop book, treatise, 186.
wives, insanity among, Ohio, 797.
Farming—
dairy. (*See* Dairy Farming.)
irrigation, in Gallatin Valley, Mont., 793.
treatise, 898.
(*See also* Agriculture.)
Farms—
Corn Belt, organization, *cattle feeding enterprise in,* 88.
family living from, U.S.D.A., 897.
internal readjustments, public agencies in, 896.
Farms—Continued.
near Wuhu, China, economic and social survey, 597.
of Brie, France, 894.
of Georgia, field and crop labor, U.S.D.A., 190.
of Iowa, costs and incomes, 687.
of West Virginia, organization and management, W.Va., 488.
rented, taxation, U.S.D.A., 90.
Scottish, standards of production and net output, 688.
Fat—
colostral, chemical and physical constants, 203.
of goats' butter, composition, 502.
of yeast, vitamin A in, 502.
utilization in animal body, 763.
Fats—
animal and vegetable, statistics, 203.
coconut and palm kernel, methods of estimating, 806.
extraction from cereal products, 807.
in dairy products, determination methods, Conn.Storrs, 808.
iodine number determination, 315.
vitamin A in, inactivating action of other fats on, 62.
(*See also* Oils.)
Fat-soluble A. (*See* Vitamin A.)
Fatty acids—
as *contact insecticides,* 452.
in linseed varnishes and oils, 810.
iodine number determination, 315.
volatile, production in intestinal tract of calves, N.Y.Cornell, 378.
Federal—
Farm Loan Act and amendments, 90.
power commission, history, activities, and organization, 587.
Trade Commission report on grain trade, 191.
Feed consumption, relation to protein and energy *retention, Mo., 464.*
Feeding experiments. (*See* Cows, Pigs, *etc.*)
Feeding in public schools in England, 563.
Feeding stuffs—
analyses, Ariz., 769; Ky., 269; R.I., 465.
analyses and law of Oregon, 572.
calculating values, 66.
commercial, value, 666.
digestibility, Mass., 572.
inspection and analyses, Conn.State, 666; N.J., 666; Tex., 667; Vt., 667.
inspection and analyses in Louisiana, 666.
inspection and analysis in Ohio, 667.
phosphorus in, nutritive value, 867.
statistics, U.S.D.A., 293.
succulent, preservation by electricity, 168.
Fence posts—
preservation, 287; Iowa, 789; Mo., 482.
preservative tests, 891.

Ferments. (*See* Enzymes.)
Fern, variegation in, genetics, 330.
Ferromanganese, native, fertilizing value, 517.
Fertility in Drosophila, effects of X-rays and temperature, 428.
Fertilizer—
experiments, Minn., 119.
experiments, financial returns from, error in interpreting, 119.
(*See also special crops.*)
handbook, American, 819.
industry in Canada, 220.
law of Georgia, 121.
requirements of soils. (*See* Soils.)
situation in various foreign countries, 122.
Fertilizers—
analyses in Maryland, 122.
and bone products, treatise, 724.
and manures, treatise, 819.
biological control of effect, 625.
catalytic, tests, 517.
concentrated, use, 818.
effect on number and size of potato tubers, 635.
effect on nutritive value of wheat, Ohio, 566.
for cut-over lands, Idaho, 514.
for greenhouse soils, Ohio, 514.
inspection and analyses, Ind., 724; Ky., 420; Mass., 22; Mo., 220; N.J., 22, 220; R.I., 420.
inspection and analyses—
in Georgia, 121.
in Maryland, 220.
in North Carolina, 220, 622.
iodine determinations in, 201.
mineral nitrogen in, determination, 715.
nitrogen determination in, methods, 804.
nitrogenous. (*See* Nitrogenous fertilizers.)
phosphoric acid determination in, 109.
registration, N.J., 220.
studies, N.C., 818.
use on Iowa soils, Iowa, 420.
world's production and consumption, 22.
Fiber—
crops, studies, Can., 134.
crude. (*See* Cellulose.)
production in bast fiber plants, effect of nutrition, 235.
strands of flax and hemp, breakdown, 337.
Fibers, minor, international trade, 296.
(*See also* Hemp, Henequen, *etc.*)
Fidia viticida. (*See* Grape root-worm.)
Field crops—
improvement, technique in, 289.
solar energy used by, 508.
work in—
Assam, 31.
Bengal, 632.
Burma, 31.
Field crops—Continued.
work in—continued.
India, 632.
Italy, 231.
Kenya, 632.
Nigeria, 835.
Philippines, 133.
Porto Rico, 135.
Punjab, 632.
Pusa, 531.
Tanganyika, 32.
Tunis, 134.
(*See also* Crops, Forage crops, Root crops, *etc.*)
Field experiments—
eliminating error in, Pa., 733.
methods, 527.
plat technique, 835.
probable error in, 632.
Fig—
smut, notes, Calif., 354.
soft rot, notes, Calif., 448.
trees, sod *v.* clean-culture plats, Miss., 239.
Figs—
edible, from caprifig seed, 844.
Smyrna, culture, 643.
Filaria reconditu, morphology and life cycle, 363.
Fillies, purebred draft, feeding, Ill., 71.
Filter materials, adsorption effects on sugar solutions, 110.
Filtering agents for cane juice, comparison, 612.
Filter-press cake as cane fertilizer, 121.
Filters, membranous, use in microbiology, 23.
Fingerprints, statistical analysis, 522.
Fire insurance, farmers' mutual, in United States, 595.
Fires, forest. (*See* Forest fires.)
Fish—
liver, vitamin content, Wis., 459.
meal *v.* meat meal for poultry, N.C., 779.
meal, vitamin in, 571.
oil as adhesive in spray, 452.
Fishes for destruction of mosquito larvae, 859.
Flax—
and products, 530.
and wheat mixtures, tests, N.Dak., 834, 529.
breakdown of fiber strands, 337.
browning disease, notes, 246.
culture experiments, U.S.D.A., 132.
disease new in United States, 851.
fertilizer experiments, 626.
fiber, structural characters, 531.
in Oregon, Oreg., 235.
industry, profitableness, Wis., 432.
international trade, 296.
plant, botanical study, 522.
production in British Empire, 530.
rotation and tillage experiments, U.S.D.A., 528.
seed, as a farm crop, U.S.D.A., 34.

Flax—Continued.
- seeding experiments, Can., 530; Minn., 130.
- solar energy used by, 508.
- studies, Can., 134.
- tillage and seeding tests, N.Dak., 334.
- variety tests, Can., 530; Minn., 130; N.Dak., 334, 529.
- wet spinning, 531.
- wilting disease in North Dakota, 851.

Flaxseed, oil in, determination, U.S.D.A., 611.

Flea beetle—
- control, N.C., 755.
- on beets, Utah, 254.

Fleas, relation to plague, 758.

Flies—
- and foot-and-mouth disease dissemination, 886.
- house. (*See* House flies.)
- white. (*See* White fly.)

Flood flow characteristics, 82.

Florida Station, notes, 196.

Flour—
- analyses, Conn.State, 657.
- and wheat, studies, 311, 802.
- ashing, use of glycerol in, 314.
- baking quality, determination, 504.
- composition, effect of storage, Utah, 861.
- doughs, carbon dioxide diffusion ratio in, 410.
- drying, 806.
- export shipments, routing, 295.
- foreign import duties on, 595.
- gluten proteins of, identity, 409.
- grades, studies, 410.
- mill streams, gluten quality, 409.
- milling and bread making, bibliography, U.S.D.A., 9.
- milling industry research problems, 614.
- Missouri, for breadmaking, Mo., 58.
- moisture determination in, 715, 806, 807.
- patent wheat, irradiated, effect, 568.
- strength, chemistry of, 8.
- strength, index, 410.
- yield, relation to test weight of wheat, 288.
- (*See also* Bread.)

Flower—
- color, alteration through external factors, 424.
- spotting, inheritance of, 628.

Flowers—
- anthocyanin in, origin, 726.
- ecology and insects, 728.
- morphology and anatomy as affected by alpine climate, 728.
- opening and closing, 825.
- (*See also* Plants, ornamental.)

Flukes in ewes, treatment, 586.

Fluorine in diet of rat, effect on teeth, 660.

Fluosilicate, tests, 253.

Fodder crops. (*See* Forage crops.)

Fomes—
- *lignosus*, notes, 153.
- spp., notes, 148.
- *yucatanensis*, notes, 246.

Food—
- and principles of dietetics, treatise, 456.
- animals, ratio of births and slaughter, 167.
- antirachitic properties, effect of light, Wis., 463.
- buying and markets, textbook, 899.
- effect on metabolism of goat, 664.
- factors, sex differences in requirement, 659.
- in house refrigerator, 363.
- intake of rats, age and sex differences in, 573.
- intake of rats during pregnancy and lactation, 573.
- Investigation Board of Great Britain, report, 260.
- keeping quality, effect of temperature, 363.
- of various races of India, 59.
- preservation, 694.
- preservation, treatise, 208.
- preservatives and coloring matter in, 160.
- specific dynamic action, 60.
- study club work, 694.
- supply of New England, 394.
- supply, world, bibliography, U.S.D.A., 896.
- (*See also* Diet.)

Foods—
- analyses, Conn.State, 657.
- and nutrition, extension work in, U.S.D.A., 899.
- and nutrition, Government publications on, list, U.S.D.A., 260.
- and their treatment, effect on growth and reproduction, 62.
- canned. (*See* Canned foods.)
- iodine determinations in, 201.
- irradiated, impartation of antirachitic properties, 568.

Foot-and-mouth disease—
- causative organism, morphology and cultivation, 181.
- cause, 79.
- control, newer methods, 181.
- dissemination and flies, 886.
- immunization against, 79.
- outbreak in Great Britain, 582.
- outbreaks, 179.
- papers on, 78.
- prevalence in various countries, 583.
- report, 178.

Forage—
- crops, comparison, Mo., 431.
- crops, studies, Nebr., 433.
- crops, variety tests, N.Dak., 529; U.S.D.A., 528.
- grasses, variety tests, 133.
- poisoning. (*See* Plants, poisonous, *and specific plants*.)

Forest—
administration. (*See* Forestry.)
fire protection, liability ratings in, 540.
fire season in Idaho, U.S.D.A., 211.
fires and humidity, 113.
fires, effect on plant succession, Ohio, 745.
fires, losses from, Ohio, 798.
fires, rôle of weather forecasts in predicting, U.S.D.A., 211, 718.
insect damage, estimating, 358.
insects, repression by Palearctic birds, 652.
management in northern India, 42.
mensuration, treatise, 244.
officers of British Empire, list, 846.
plantations, wind and exposure as factors, 441.
policy for South Africa, 744.
products, utilization, national conference on, U.S.D.A., 347.
Reservation Commission, report, 145.
resources of Finland, 347.
resources of Suriname, survey, 540.
soils, formation of Bleichsand and Orterde in, 115.
soils, physical properties, 113.
soils, profile studies, 213.
trees. (*See* Trees.)
zoology, Danish, treatise, 651.
Forestry—
at Northern Great Plains Station, U.S.D.A., 540.
in Ajmer-Merwara, 244.
in Bengal, 244.
in Bihar and Orissa, 145.
in *Bombay*, 645.
in British Columbia, 644.
in Burma, 146.
in Canada, 145.
in Central Provinces, 441.
in Coorg, 146.
in Great Britain, 645.
in *India*, 441.
in New Hampshire, 145.
in Nigeria, 43.
in Northwest Frontier Province, 244.
in Ontario, 645.
in Oregon, 145.
in South Australia, 441.
in *Uganda*, 846.
in Union of South Africa, 645.
in Washington, 42.
research in Belgium, 42.
Schlich's manual, 42.
Forests—
of Bombay, popular account, 645.
of British Guiana, 145.
of Illinois, Vermilion Co., 744.
of valley coal fields of Virginia, 145.
regeneration by seed sowing, 540.
Formaldehyde—
effect on plants, 326.
photochemical production, 26, 125.
tank formation drill, 852.
Formic aldehyde, effect on bean plant, 521, 724.
Foulbrood—
American, control, 259; Conn.State, 450.
American, spread, 259.
disinfectants for, 655, 860.
law and revised regulations, Tex., 57.
Fowl—
cholera and fowl typhoid, differential diagnosis, 786.
cholera, notes, 279.
disease in *Palestine*, *leucocyte inclusions in*, 386.
pest, European, in United States, papers on, 786.
pest, pathology, 786.
plague, new chicken disease in America, 183.
plague, new, in Japan, 82.
plague, summary, N.J., 482.
typhoid among turkeys, Calif., 477.
typhoid and fowl cholera, differential *diagnosis*, 786.
typhoid, notes, N.C., 786.
typhoid, vaccine for, N.C., 889.
Fowler's *solution for fitting livestock, effect*, 571.
Fowlpox, vaccination against, 785.
Fowls—
gonads of, histological studies, 329.
metabolism in, 172.
modifications by sexual hormones, 130.
normal histology, 279.
secondary sex characters in, determination, 130, 632.
(*See also* Chickens, Hens, Poultry, *etc.*)
Foxes—
lungworms in, 787.
roundworm in, Wis., 479.
Foxtail millet, inheritance in, 831.
Freight rates, measurement, 294.
Frit flies, notes, N.Dak., 652, 857.
Frogs—
as insect collectors, 357.
sex differentiation in, 524.
Frost protectors for early planting, Mich., 341.
Fructose utilization by fungi, 123.
Fruit—
brown rot, studies, 151.
bud differentiation in deciduous fruits, Calif., 439.
diseases in Illinois, 547.
fly, Mediterranean—
in Almeria, Spain, and embargo on grapes, 454.
in *Palestine*, 654.
in Victoria, eradication, 257.
summary, 51.
fly, studies, 362.
grafts, variation in growth, 843.
industry of United States, effect of climate and weather, 111.
inhibitory effect on vegetation, 142.
juices, effect of storage on antiscor-

Fruit—Continued.
juices, jellying, 209.
juices, pectinous, extraction and clarification, Oreg., 810.
moth, oriental. (*See* Peach moth, oriental.)
nibbler, trapping, 257.
spray service of Weather Bureau, 112.
stock, effect on variety, 143.
testing, studies, Minn., 140.
tree leaf roller in British Columbia, 155.
tree leaf roller, notes, 859.
trees, chlorosis in, control, N.Mex., 146.
trees, culture, 641.
trees, effect of grass, 842.
trees, irrigation studies, Calif., 436.
trees, pruning, Calif., 37.
trees, pruning, treatise, 641.
trees, rest period, effect of sprays, 240.
Fruits—
carload shipments of, U.S.D.A., 91.
citrus. (*See* Citrus fruits.)
culture, Can., 340, 840.
culture at Newlands, U.S.D.A., 840.
culture experiments, Minn., 139.
culture in North Dakota, N.Dak., 342.
determining maturity, Mich., 743.
extension work with, U.S.D.A., 695.
growing, treatise, 641.
hardy, of Great Britain, handbook, 843.
notes, Miss., 239.
of Temperate Zone of North America, treatise, 37.
propagation, Calif., 843.
shipments and unloads, U.S.D.A., 293.
small, culture, 343.
small, spray schedules for, Mich., 37.
small, treatise, 536.
sun-drying, Calif., 614.
varieties tested at Mandan, N.Dak., U.S.D.A., 140.
variety tests, Okla., 141.
(*See also* Orchards, Apples, Peaches, *etc.*)
Fungi—
damping-off, inoculation of coniferous stems, 356.
entomogenous, use, 556.
growth, effect of glucose and fructose, 128.
growth rate and utilization coefficients, 519.
physiology of, studies, 122, 224.
toxicity of copper for, 542.
wood-destroying, growth relation to pH of media, 224.
wood-destroying, of Java, 153.
Fungicides—
analyses, Me., 539; N.J., 37.
for apple scab, comparison, Pa., 48.
(*See also* Sprays *and specific kinds.*)
Fur-bearing mammals, food predilections, 251.
Furnace—
heating, value of fans in, 590.
systems, warm air, variations in temperature at register faces, 686.
Fusarium—
blight of cereal crops, 43.
pigment development, rôle of pH, 828.
resistant cabbage, studies, 849.
spores, morphology, effect of temperature, 847.
taxonomic studies, 747.
Fusarium lycopersici—
control, Mo., 442.
notes, Calif., 446.
Fusarium moniliforme—
ascigerous stage, 747.
notes, 850, 851; Ill., 851; La., 850.
on cereals, pathogenicity, 847.
Fusarium—
saubinetii, notes, La., 850.
sp., notes, 43.
spp., notes, 46.
vasinfectum, notes, 44.
viticolum, notes, 250.
Fusicladium dendriticum. (*See* Apple scab.)
Fusicoccum sp., notes, 43.
Futures contract, 530.
Galalith toxicity to wheat sprouts, 21.
Galerucella—
cavicollis, notes, Mich., 557.
luteola. (*See* Elm leaf-beetle.)
Gall midges, key, 860
Garbage, feeding value, Ariz., 774.
Garden—
centipede, biology and control, 58.
chronicles of, treatise, 144.
clubs, boys' and girls', 899.
crops. (*See* Vegetables *and specific crops.*)
Gardening—
treatise, 40, 640.
tropical, treatise, 844.
Garlic, effect on flavor and odor of milk, U.S.D.A., 75.
Gas engines. (*See* Engines, internal-combustion.)
Gasoline tax in 1924, data, U.S.D.A., 284.
Gastric lesions in rats, 165.
Geese, use in controlling weeds in cotton fields, N.Mex., 840.
Gel or sol formation in soils, 418.
Gelatin—
chemistry of, 312.
effect on ice cream, 677.
effect on ice cream and ices, N.Y.State, 476.
for ice cream, bacterial content, 883.
quality, Okla., 177.
Gelechia—
gossypiella. (*See* Bollworm, pink.)
trialbamaculella, notes, 555.
Genes, evidence of structure in, 426.
Genetics—
development, 226
laboratory course in, outline, 298.
relation to breeding practices, 571.

Genetics—Continued.
studies at Carnegie Institution, 829.
treatise, 522.
(*See also* Heredity *and* Hybridization.)
Geochemistry, data, 212.
Geococcus—
citrinus n.sp., notes, 158.
oryzae, notes, 158.
Geography—
commercial, handbook, 95.
economic, textbook, 694.
Geology—
engineering, treatise, 587.
of Goose Creek basin, Idaho, 83.
Georgia Station, report, 299.
Geranium stem rot, description, 855.
Germination, energy yield in, effect of temperature, 827.
Gestation period, effect of compulsory work during, 833.
Gibberella saubinetii—
notes, 44, 748, 850, 851; Ill., 851.
on rice, 151.
Gipsy moth—
imported egg parasites of, 561.
summary, 51.
work, Conn.State, 450.
Girls, basal metabolism, 862.
Gladioli, varieties and culture, treatise, 644.
Glanders—
experimental studies, 382.
relation to meliodosis, 678.
Gliadin, isoelectric points, 803.
Gloeosporium—
limetticolum, susceptibility of citrus varieties to, 549.
piperatum, studies, Ga., 246.
Glomerella—
gossypii, notes, 148, 351.
psidii, notes, 246.
rufomaculans on grape in Japan, 151.
Glucose—
determination, method, 504.
in vitro, effect of insulin and muscle tissue, 64.
utilization by fungi, 123.
Glucoside, second, in *Monotropa hypopitys*, 827.
Glue, chemistry of, 312.
Glutamic acid, decomposition, 310.
Gluten—
composition, 803.
flours and breads, sugar value, 266.
hydration, effect of ammonium chloride, 105.
meal, value for egg production, Mo., 471.
of flour mill streams, quality, 409.
proteins, identity, 409.
quality, 105.
quality, viscosity as measure, 814.
washing problem, 105.
Glutenin, isoelectric points, 803.
Glycerol, use in aging flour, 814.
Glycine, decomposition, 310.
Glycocoll as protein substitutes for milk goats, 275.
Glyphodes pyloalis, notes, 558.
Gnomonia—
rubi, notes, 153.
sp., notes, Iowa, 746.
veneta, notes, 43.
Goats—
butter, composition of fat in, 502.
care, management, and uses, 575.
castrated, growth studies, 268.
energy exchange, factors affecting, 663.
milking, effect of sunlight, Wis., 464.
protein substitutes for, 275.
Goiter—
as an iodine deficiency disease, 63, 202.
endemic, in Colorado, 663.
in poultry, 786.
in Utah, relation to water supply, 369, 463.
notes, Minn., 477.
prophylaxis, treatment of water for, 463.
Goldfish, inheritance studies, 832.
Goloubatz fly, ravages in Rumania, 257.
Gonad grafts in embryonic chicks, 631.
Gonads of fowls, histological studies, 329.
Gonderia ovis, notes, 183, 482.
Gongylonema spp., notes, 760.
Gonipterus scutellatus, studies, 56.
Gooseberries—
culture, 343; Mo., 241.
taxonomic study, N.Y.State, 424.
Gooseberry witch-broom aphid, development, 359.
Gopher, pocket, poisoning, Minn., 551.
Gorytes costalis, notes, 656.
Grafting, effect on plant perfumes, 627.
Grain—
aphis, spring, notes, Okla., 155.
bins, estimating capacity, U.S.D.A., 895.
culture experiments, U.S.D.A., 333.
diseases, control, Wis., 443.
effect of irrigation water, 735.
effect of preceding crop, U.S.D.A., 335.
elevators, floating dust in, removal, 484.
ground v. whole for chickens, Ohio, 874.
hybrids, comparison, Minn., 130.
judging club, 695.
mixtures, seeding experiments, Minn., 130.
plowing experiments, U.S.D.A., 885.
production in Sicily, climatic conditions, 615.
rations for pigs on alfalfa pasture, U.S.D.A., 878.
statistics in United States, 796.
stored, protection from insect attack, Calif., 52.
trade, 691.
trade, Canadian, yearbook, 396.
trade-report, 191.

Grain—Continued.
variety tests, Ariz., 733.
(*See also* Cereals *and* Oats, Rye, Wheat, *etc.*)
Granary weevil, notes, 652.
Grape—
court-noué, studies, 354.
diseases in Illinois, 547.
diseases in Japan, 151.
leafhopper, control, 454.
leaves, chlorosis and premature fall, 325.
mildew, notes, 43.
Oidium, notes, 151.
rootworm, control, N.Y.State, 455.
rust, notes, 43.
stocks, American, adaptability in South Africa, 844.
white rot, studies, 250.
Grape-hyacinth bulbs, production, U.S.D.A., 144.
Grapes—
artificial pollination, 143.
Concord, pruning, Mich., 40.
culture at Newlands, U.S.D.A., 840.
culture experiments, Ariz., 741.
culture in Rumania, 344.
fresh, preservatives for, Calif., 744.
from Almeria, Spain, embargo on, 454.
fruit weight relation to bud position, Ohio, 535.
harvesting and packing in California, Calif., 690.
introduction into Porto Rico, 142.
phylloxera resistance in, Calif., 537.
pruning experiments, 398.
spray schedules for, Mich., 37.
standardization, Calif., 744.
thinning effect, Calif., 436.
training, N.Mex., 140.
varieties, Miss., 40.
wine, in South Africa, analyses, 205.
winter protection, U.S.D.A., 141.
Grapevine—
grafts, diseased, notes, 250.
root rot in Missouri, 354.
Graptolitha laticinerea, control, 358.
Grass—
effect on fruit trees, 842.
looper caterpillars, outbreaks in Porto Rico, 156.
mixture, seeding and pasturing tests, U.S.D.A., 335.
Grasserie of silkworms, etiology and epidemiology, 255.
Grasses—
breeding experiments, 230.
cultivated, of secondary importance, U.S.D.A., 336.
culture experiments, Guam, 430.
for winter pastures, N.C., 835.
noxious tropical, 839.
South African, key, 231.
varieties, forage value, U.S.D.A., 132.
variety tests, Ariz., 733; Can., 530; Guam, 430; N.Dak., 334.
Grasses—Continued.
zonate eye-spot on, 848.
(*See also* Grassland, Meadows, Pastures, *etc.*)
Grasshoppers—
campaign against, 154; Wis., 451.
campaign against, in Wisconsin, 358.
destruction, 52.
effect of carbon dioxide, 254.
elegant, summary, 358.
experiences with, Mont., 51.
lesser migratory, notes, 756.
migratory, destruction, 858.
of British Columbia, 756.
on beets, Utah, 254.
Grassland—
formation and changes in, 825.
in Scandinavia, experiments, U.S.D.A., 336.
(*See also Grasses, Meadows, and Pastures.*)
Grazing—
experiments, cooperative, U.S.D.A., 168, 574.
research, 824.
(*See also* Range.)
Green bug. (*See* Grain aphis, spring.)
Green manure crops for Arizona, Ariz., 419.
Green manuring—
systems, effect, Mo., 414.
value, U.S.D.A., 333.
Green, W. J., biographical sketch, 900.
Greenhouse plants, diseases, 550.
Ground squirrels. (*See* Squirrels, ground.)
Grouse, ruffed, diseases of, 787.
Growth-promoting accessory. (*See* Vitamin.)
Guam Station, report, 496.
Guano, Peruvian, fertilizing value, Conn.-Storrs, 737.
Guava fruit scab, notes, 246.
Guinea pigs—
inheritance of characters, 522.
mixed infection in, 885.
Gutta-percha diseases, 148.
Gymnosporangium juniperi-virginianae, notes, 43.
Gypsum—
biochemical effect on Iowa soils, 622.
effect on Palouse silt loam, 516.
tests for cucumber beetle, Mo., 450.
Habrobracon—
johannseni, biology, 654.
juglandis, inheritance of sterility and other defects, 525.
variabilis, notes, U.S.D.A., 54.
Habrocytus languriae, notes, 363.
Habronemiasis in England, 680.
Haemodipsus—
setoni n.sp., description, 53.
ventricosus, notes, 53.
Haemogregarina canis, studies, 786.
Haemonchus contortus, summary, Conn.-Storrs, 785.
Hair, ingested, factor in gastric lesions, 166.

Halogen salts, effect on salivary digestion, 761.
Ham beetle, red-legged, studies, 758.
Haplonyx tibialis, studies, 56.
Harding grass, value, Calif., 430.
Hares and rabbits, crossing experiments, 630.
Harrows, comparative tests, 791.
Harvest weather forecasts of Weather Bureau, 112.
Hay—
as cause of depraved appetite in cattle, 632.
mixtures, culture experiments, Md., 332.
mixtures, seeding experiments, Md., 332.
statistics, U.S.D.A., 293.
use for milk production, 377.
v. straw for wintering heifers, Can., 879.
well cured, importance, Mich., 780.
(*See also* Meadows, Grasses, *and* Alfalfa, Timothy, *etc.*)
Headers, use in Algeria, 287.
Health education program, outline, 298.
Heart, effect on blood regeneration, 867.
Heat—
conductivity of various materials, 285.
effect on solubility of calcium and phosphorus in milk, 881.
loss in gas engines, 85.
of wetting for estimating colloidal material in soils, 319.
of wetting of soil colloids, factors affecting, 817.
transmission, effect of radiator finish, 389.
transmission of insulating materials, papers on, 684.
(*See also* Temperature.)
Heather vole, Alpine life of, 50.
Heating and ventilating installations, data useful in, 287.
Hedgehog, chromosome numbers in, 523.
Hegari, cracked, and tankage, feeding value, Ariz., 774.
Heifers—
dairy, legumes for, Ohio, 879.
growth, factors affecting, 175.
legumes for, Ohio, 579.
protein requirements, Mo., 473.
(*See also* Cows.)
Heliophila unipuncta. (*See* Army worm.)
Heliothis obsoleta. (*See* Bollworm.)
Heliotropism and plant growth, 623.
Helix aspersa, attacks on young sycamores, 252.
Helix, predacious, in South Africa, 856.
Helminthosporium—
giganteum, notes, 848.
sacchari, notes, 147, 250.
sativum spores, variations in length, 749.
sp. on corn, 146.
spp., notes, 750.
Helminthosporium—Continued.
spp. on cereals, 542.
spp. on sugar cane, 147, 542.
Helomyzidae, monograph, 560.
Hemerophila—
pariana, notes, 652.
subplagiata, notes, 558.
Hemisarcoptes malus, relation to oyster-shell scale, 260.
Hemlock and its environment, 144.
Hemochromatosis, cause, 267.
Hemophilia, inheritance of, 427.
Hemorrhagic—
disease, unidentified, in cattle, Nev., 478.
septicemia. (*See* Septicemia.)
Hemp—
breakdown of fiber strands, 337.
fertilizer experiments, Wis., 432.
in Germany, 235.
industry, profitableness, Wis., 432.
international trade, 296.
manila. (*See* Abaca.)
production in British Empire, 530.
seed cake, feeding value, 579.
seed, factor essential for reproduction in, 62.
seeding experiments, Wis., 432.
studies, Can., 134.
sunn, as green manure and source of fiber, 721.
variety tests, Can., 530; Wis., 432.
Henequen—
and sisal, reciprocal crossings, 332.
international trade, 296.
Hens—
cost of production, Okla., 174.
diseases of reproductive organs, 681.
laying—
animal proteins for, Iowa, 778.
effect of ultraviolet light, 274.
feeding methods, N.J., 472.
keeping indoors, Ohio, 874.
protein and minerals for, Ohio, 577.
(*See also* Egg production.)
prevention of death due to heat, N.Mex., 173.
productivity, time of molt as index, 471.
Herculia phoezalis on cypress, 158.
Herdbooks, information necessary for, papers on, 269.
Heredity—
and chromosomes, 126.
and environment, 430.
in barley, 729.
in corn, 29.
in cotton, 331.
in foxtail millet, 831.
in goldfish, 832.
in man, present knowledge, 425.
in rabbits and guinea pigs, 522.
in sheep, Okla., 427; Wyo., 820.
in sweet potatoes, 831.
in tetraploid Daturas, 227.
laws and mechanism, treatise, 226.

Heredity—Continued.
mosaic, studies, 729.
of acquired characteristics, 230.
of acquired immunity, 28.
of body weight in poultry, R.I., 629.
of chemical characters in corn crosses, Iowa, 730.
of chlorophyll characters in corn, 229.
of color. (*See* Color inheritance.)
of drinking habit in a family, 29.
of earlessness and short ears in sheep, 729.
of egg color in silkworms, 522.
of fecundity in White Leghorns, N.J., 29.
of flower spotting, 628.
of grain color in wheat, 128.
of head form in man, 629.
of hemophilia, 427.
of milk production of Holstein-Friesian cattle, 72.
of rate of feathering in poultry, 427.
of spring and winter growing habit in barley, 830.
of visceral abnormalities in mice, 833.
studies, 522.
treatise, 425.
Herring cake decomposition, factors affecting, 219.
Hessian fly—
damage to wheat yield, 361.
free date for seeding wheat, Iowa, 754.
in Montana, Mont., 51.
in Poland, 860.
notes, Mo., 451; N.Dak., 652, 857.
parasite, synonymy, 160.
parasites of, N.C., 755.
problem in Kansas, 361.
Heterakis—
gallinae, control, 183.
vesicularis, control, Calif., 449.
vesicularis, notes, Calif., 477.
Heterospilus n.spp., description, 656.
Hevea brasiliensis. (*See* Rubber.)
Hexamethylenetetramine—
action on plants, 326.
effect on bean plant, 521, 726.
Hieroxestis subcervinella, synonymy, 256.
Highway transportation survey of Maine, U.S.D.A., 483.
Highways. (*See* Roads.)
Hippeastrum johnsonii mosaic, intracellular bodies of, 851.
Hippodamia tridecim-punctata, bionomics, 56.
Histidine metabolism, studies, 762.
Hog cholera—
control, 78.
immunity, Ind., 179.
serum, clarifying, 384.
Hogs. (*See* Pigs.)
Home economics—
contribution to citizenship training, 95.
curricula in land-grant colleges, 598.
education and extension, papers on, 598.
Home economics—Continued.
research in, papers on, 598.
studies, Mo., 495.
teachers, sources of information for, 397.
teachers, state schools for, in Norway, 598.
teaching, problems in, 898.
training in Norway, 898.
workers, advanced degrees held by, 7.
Home making, teaching, equipment for, 898.
Homes—
building, furnishing, and management, 694.
improving appearance, 898.
Hominy, irradiated, effect, 568.
Homona menciana, notes, 558.
Honey—
plants in Cuba, 51.
plants, nectar glands, structure, 324.
use in the home, Ind., 456.
Honeybees. (*See* Bees.)
Honeydew seed, germination studies, Colo., 140.
Honeysuckle leaf roller, notes, 257.
Hookworms—
in Paraguay, anthelmintics for, 787.
of dogs and foxes, 552.
Hoplisus costalis, notes, 656.
Hoplothrombium, new genus, description, 656.
Hops, insects affecting in Great Britain, 554.
Hormone mediums, preparation, 582.
Horse beans, studies, 337.
Horse specialist, job of, 571.
Horseflesh, vitamins A and B in, 764.
Horses—
big teams, harnessing and hitching, 685.
blood of, 586.
draft, feed consumption and cost, Can., 873.
draft, future shortage, Ohio, 873.
endemic disease of, 279.
feed cost of raising, Can., 668.
feeding experiments, Ill., 71; Mo., 470.
nematode parasite of, 280.
rations for, Okla., 68.
situation, Mich., 374.
Horticultural experiments, probable error in, 740.
Horticulture, clonal variety in, 840.
House fly and intestinal myasis, 454.
Houses, model, treatise, 694.
Humic acid, absorption of potash by, 420.
Humidity—
and forest fires, 113.
relation to Rhizopus infection of sweet potatoes, 854.
Humification of soil organic matter, determining, 503.
Hummingbirds, migration, 51.
Humus—
in Brazilian coffee soils, 418.
value for truck crops, 142.

Huxley, T. H., life and works, 829.
Hyalomma aegyptium—
morphology and bionomics, 260.
notes, 761.
Hybridization, study in evolution by, 630. (*See also* Animal breeding, Plant breeding, *and specific animals and plants.*)
Hydnum omnivorum n.sp., life history, 544.
Hydrocyanic acid—
fumigation with, efficiency, Calif., 453.
in millet and sorghum, 571.
toxicity to plants, 829.
Hydroelectric power as a by-product of irrigation storage works, 285.
Hydrogen-ion concentration—
determination by spectrophotometric method, 714.
relation to animal and plant growth, 125.
Hydrophobia. (*See* Rabies.)
Hylemyia cilicrura. (*See* Seedcorn maggot.)
Hymenoptera, parasitic—
importance in south India, 861.
method of feeding, 560.
parasitic, new, 561.
Hyperaspis silvestri, notes, 653.
Hyperinsulinism and dysinsulinism, 368.
Hypoderma. (*See* Cattle grubs.)
Hysterectomy and oestrous cycle of opossum, 732.
Ice cream—
bacteria in, gelatin as source, 883.
effect of ingredients on freezing process, Mo., 77.
factories, statistics, 277.
fat determination in, 315, 809.
manufacture, 883; Okla., 177.
mix, neutralization and homogenization, 676.
mixes, calculating, Calif., 476.
mixes, freezing tests, 676.
overrun and quality, factors affecting, 677.
properties, effect of percentage of butterfat, Mo., 76.
shrinkage, factors affecting, 888.
texture, N.Y.State, 475.
total solids in, determining, 109.
Ichneumonidae, hibernation, 760.
Ichneumonids, biology, 57.
Icterohematuria among sheep, Colo., 179.
Illinoia pisi. (*See* Pea aphid.)
Illinois University, notes, 97.
Imhoff tanks—
bacteria in, fluctuations, 892.
foaming, rôle of microscopic animals in, 288.
Immigrants and American agriculture, 894.
Immunity—
acquired, inheritance of, 28.
in natural infectious disease, treatise, 581.
response, mechanism, 677.
Immunization experiments with germ-free filtrates, 78.
(*See also* Anthrax, Hog cholera, Tuberculosis, *etc.*)
Imperata cylindrica as weed in Belgian Kongo, 839.
Incubation—
artificial, in New Mexico, N.Mex., 878.
artificial, optimum conditions, 877.
artificial, scientific principles, 71.
optimum temperature, Ind., 173.
physics of, 672.
Incubator, multiple temperature, for use with cotton insects, 755.
Index—
animalium, 551.
Kewensis, history of compilation and use, 122.
numbers of production, wages, and prices, Ohio, 898.
Indiana Station—
Moses Fell Annex, report, 497.
notes, 97, 697.
report, 194.
Indicator, absorption by serum, 610.
Indicators, dissociation constants, determination, 714.
Industry—
and agriculture, price balance, 492.
elimination of waste in, 597.
Infants—
cereal feeding for, 457.
feeding, acidification of milk for, 367.
feeding, recent advances in, 866.
food requirements, 263.
new born, respiratory metabolism, 866.
(*See also* Children.)
Inheritance. (*See* Heredity.)
Insecticide industry, chemical problems of, 110.
Insecticides—
analyses, Me., 539; N.J., 87.
arsenical, electric charges, 452.
distribution, visibility, 452.
effectiveness, method of computing, 452.
for slugs, tests, 252.
new, preparation, 452.
soil, tests for Japanese beetle, N.J., 258.
(*See also* Sprays *and specific forms.*)
Insects—
beneficial, introduction into Hawaii, 653.
blood of, pH value, 856.
blood of, studies, 51.
chewing, non-arsenicals for, 857.
control, 856.
control in New Jersey, 253.
dissemination by air currents, 357.
economic, control, 856.
economic, in Florida, control, 856.
economic, in Norway, 755.
entomophagous, use in agriculture, 653.
food habits, ratios, 253.
forest. (*See* Forest insects.)

Insects—Continued.
- in Canada, notes, 554.
- in Porto Rico, check list, supplement, 51.
- in Quebec, indexes, 358.
- index of reports, 154.
- injurious in—
  - British Columbia, 253.
  - Great Britain, 51.
  - Jamaica, 555.
  - Kenya Colony, 156.
  - Labuan, 253.
  - Mississippi, 51.
  - Montana, Mont., 51.
  - New Zealand, 855.
  - Poland, 857.
- injurious to crops. (*See special crops.*)
- introduction, propagation, and distribution in Hawaii, 253.
- migration, 856.
- oviposition response of, U.S.D.A., 253.
- photographing, Conn.State, 450.
- scale. (*See* Scale insects.)
- social, 156.
- structure and life, treatise, 357.
- symbiosis in, 856.
- tree and shrub, manual, 252.

Insulating materials—
- heat transmission of, 684.
- tests, 285.

Insulation of roofs, 486.

Insulin—
- action and use in diabetes, 462.
- action, rôle of liver in, 166.
- effect on sugar metabolism, 64.
- in tissues and method of estimation, 612.
- intoxication, effect of various substances, 462.
- nature of action, 63.
- preparation, 804.

Insurance—
- accident, in farm work in France, 90.
- social, for rural laborers in France, 193.
- weather, developments, 615.

Intarvin in diabetic diets, value, 569.

International—
- Association of Dairy and Milk Inspectors, report, 580.
- Congress for Production of Bovine Species, report, 269.
- Congress of Plant Sciences, 699.
- Institute of Agriculture, general assembly proceedings, 597.
- Society of Sugar Cane Technologists, proceedings, 857.

Intestinal—
- contents, effect of food intake on enzymatic concentration, 457.
- roundworm, control, 184.

Inulin movement in grafts of Compositae, 726.

Inventory account book, 194.

Iodamoeba bütschlii, notes, 558.

Iodine—
- feeding experiments with ewes, Iowa, 769.
- feeding, studies, Iowa, 777.
- in Michigan water supplies, 86.
- in nutrition, 63.
- in water in Utah, relation to goiter, 369.
- number determination in fats and oils, 315.
- occurrence in nature, 201.

Iowa—
- College, notes, 498.
- Station, notes, 498.
- Station, report, 798.

Ipobracon grenadensis, notes, 156.

Ips spp., life history and habits, 259.

Iridomyrmex detectus in Australia, 57.

Iris, bearded, culture, 644.

Iron—
- accumulation in corn plants, 247.
- and zinc, comparative physiological importance, 364.
- compounds, relation to water clarification, 683.
- crucibles for alkali determinations, 714.
- deficiency and human disease, 161.
- effect on blood regeneration, 867.
- in grains, effect of irrigation water, 735.
- in spinach, 456.
- salts, toxic action on sugar cane, 829.
- sulfate effect on fruit tree chlorosis, N.Mex., 146.

Irrigation—
- demonstration farm unit, labor requirements, N.Dak., 591.
- district laws of California, 282.
- ditches. (*See* Canals.)
- effect on calcareous soil, 218.
- effect on soil temperature, 318.
- experiments, N.Dak., 529.
- experiments at Umatilla, U.S.D.A., 387.
  - (*See also special crops.*)
- farming in New South Wales, 588.
- in California, cost of water for, 587.
- in Kansas, 282.
- in Spain, plan for aid of, 282.
- pumping, electricity for, 389.
- siphons, discharge measurements, 281.
- studies, Ariz., 789.
- water, duty of, N.Mex., 185; U.S.D.A., 387.
- water, effect on cotton plants, 837.
- water, effect on mineral content of grain, 735.
- water, use and waste, Ariz., 281.
- with artesian water, 483.

Istle, international trade, 296.

Iwerne Minister Home Farm, cost accounts, 088.

Japanese beetle—
- control in New Jersey, 253.
- larvae in roots of perennial plants, destruction, U.S.D.A., 455.
- life history notes, 455.
- parasites, summary, 455.

Japanese beetle—Continued.
present status, 755.
soil insecticides for, N.J., 258.
summary, 51; Ohio, 557.
Jellying tests with citrus pectin, U.S.D.A., 13.
Jewish Agricultural Society, report, 592.
Johnson grass eradication, N.Mex., 839.
Joint ill in foals, inoculation of mare for, 279.
Jute—
cellulose, studies, 812.
international trade, 296.
physical characteristics, 634.
Kafir—
chlorophyll deficiencies in, 27.
cultivation tests, Okla., 133.
nutritional value, Okla., 66.
seeding experiments, Nebr., 433; Okla., 133.
Kainit, effect on nitrogen transformation in moor soils, 118.
Kale black rot, description, Va.Truck, 851.
Kale, fertilizer experiments, 142.
Kansas—
College, notes, 196, 799.
Station, notes, 196, 799.
Station, recent publications, 398.
Kaolins, treatment affecting gel or sol formation, 418.
Kapok—
international trade, 296.
production and uses, 634.
Kata-thermometer, use, 764.
Kentucky—
Station, notes, 97, 399, 498.
University, notes, 97, 399, 498.
Keratomalacia, etiology, 460.
Kew Index, history, character, and uses, 122.
Kitchens—
modern, arrangement and equipment, treatise, 899.
planning, 694.
Kudzu, winter behavior, Ohio, 529.
Kutter's n determinations in pipe sewers, 890.
La Carlota Experiment Station, work of, 835.
Labor wages, index numbers, Ohio, 898. (*See also* Agricultural labor.)
Lac insects, life cycle, effect of temperature, 858.
Lachnosterna sp.—
notes, Utah, 254.
on sugar cane, control, 860.
Lactalbumin, feeding value, 172.
Lactic acid—
bacteria, length of life, 581.
fermentation, 474.
in milk, effect on bacteria in fowls, N.C., 786.
Lactobacillus pentoaceticus, notes, 66.
Lactose—
determination, picric acid method, 110.
manufacture from whey, 277.
Lagoa crispata, life history and poison apparatus, 256.
Lake—
level, relation to rainfall and sunspots, 316.
waters of Wisconsin, pH value, 386.
Lambs—
best time for selling, Can., 869.
breeding, Can., 868, 869.
crossbred v. purebred, Can., 869.
disease of, Wis., 478.
early, production in Arkansas, 170.
feeding experiments, 68; Ill., 68; Ohio, 468, 574.
finishing, Okla., 170.
range, feeding and finishing, Nev., 467.
stomach worms of, Wis., 479.
weaning, early v. late, Can., 869.
(*See also* Sheep.)
Land—
and agriculture in Mexico, 596.
clearing devices, 387.
Company estate, system of management, U.S.D.A., 893.
cover studies, relation to soil survey, 814.
credit. (*See* Agricultural credit.)
cut-over. (*See* Cut-over land.)
grant colleges. (*See* Agricultural colleges.)
plaster. (*See* Gypsum.)
policies, public, history, treatise, 88.
problems in United States, 894.
reform in Finland, 190.
reform in Ireland, 291.
settlement and holdings in Argentina, 591.
tenancy, share, in France, 591.
tenure and farm investment, Nebr., 189.
tenure, international problems, 290.
tenure, place of tenancy in, 689.
value policy of taxation, 592.
value, relation to income, 189.
winter-fallowed, cultivation, 214.
Lantana—
flies, economic importance, 257.
gall-fly and seed-fly, descriptions, 654.
Laphygma exigua. (*See* Beet armyworm.)
Laphygma spp. (*See* Armyworm.)
Laspeyresia molesta. (*See* Peach moth, oriental.)
Law of diminishing returns, treatise, 290.
Lawn making, treatise, 139.
Lawns, moss destruction on, Can., 340.
Leaf—
gummosis, 148.
roller, red-banded, summary, 558.
rollers attacking orchard trees, 859.
Leaves—
anthocyanin in, origin, 726.
carbohydrate metabolism, 821.
chlorosis and premature fall, 825.
green and white, photo-electric changes in, 222.
nervation in, physiological rôle, 827.

Leaves—Continued.
sap extraction from, 223.
yellowing, migration of nitrogenous substances in, 325.
Lecaniobius capitatus n.sp., description, 561.
Legume—
forages with corn and cane for silage, Ark., 465.
inoculant inspection, N.J., 238.
Legumes—
and cereals, production in Spain, 396.
culture experiments, Idaho, 528.
disappearance of nodule bacteria from roots, 123.
for dairy heifers, Ohio, 879.
for growth of dairy heifers, Ohio, 579.
for livestock, 66.
inoculation, 123; Can., 530.
(*See also* Nodule bacteria.)
value for orchards, Pa., 439.
variety tests, Ariz., 733.
(*See also* Green manure *and* Alfalfa, Clover, *etc.*)
Lemon—
juice, antiscorbutic value after cold storage, 567.
pectin, analyses, U.S.D.A., 13.
shellbark, notes, Calif., 449.
Lemons, internal decline, Calif., 449.
Lenzites sepiaria, growth reaction toward acidity, 225.
Lepidium sativum grown in salt water, effects, 626.
Lepidosaphes—
intermittens, description, 653.
ulmi. (*See* Oyster-shell scale.)
Leptinotarsa decemlineata. (*See* Potato beetle, Colorado.)
Lespedeza—
Kobe, tests, La., 528.
variety tests, N.C., 735.
Lettuce—
growth, effect of carbon dioxide, Ohio, 519.
head, growing, N.Mex., 140.
irradiated, effect, 568.
mosaic, seed transmission, 851.
Leucocyte count, effect of yeast ingestion, 458.
Leucopis luteicornis n.sp., description, 55.
Levuana iridescens on coconuts, 859.
Levulose, manufacture, 613, 810.
Lice, sucking, of rabbits, 53.
Lichens, action on church window glass, 50.
Life, every day, science of, treatise, 693.
Light—
action on textiles, 531.
and temperature, interrelation in plant growth, 222.
artificial, effect on egg production, Ind., 173; Iowa, 778; N.C., 779.
growth reaction of Basidiobolus, 423.
period, daily, adaptation of plants to, 518.
rays, short-wave, effects, 828.
(*See also* Sunlight.)
Lilacs, oyster-shell scale affecting, Colo., 154.
Lilies, seedling, 536.
Lime—
analyses, N.J., 220.
arsenate. (*See* Calcium arsenate.)
deficiency in rations of pigs, effect, Minn., 477.
inspection and analyses, Mass., 22.
loss from soil by leaching, 117.
nitrogen. (*See* Calcium cyanamide.)
requirement of soils. (*See* Soils.)
tests for cucumber beetle, Mo., 450.
uses in agriculture, 621.
(*See also* Calcium *and* Liming.)
Lime—(*Fruit*)
tree borer in Mysore, 259.
tree looper, notes, Conn.State, 450.
Limes, coloring matter in rind, 717.
Limestone—
fertilizing value, 218.
fineness, effect on decomposition of organic matter, 323.
resources of Illinois, 621.
Lime-sulfur—
as egg-killing wash, 357.
dry-mix, fungicidal value, N.J., 847.
solutions, effect of added arsenic, N.H., 444.
sprays for vineyards and orchards, 250.
times for spraying with, 240.
Liming—
effect on plant growth, 219.
effect on sulfate retention in soil, 320.
experiments, Ohio, 217.
returns from, calcium as indicator, 819.
(*See also* Lime *and special crops*.)
Limnobaris rectirostris, notes, 363.
Linen—
industry, relation to research, 530.
weaving, ancient and modern, 530.
Linkage—
effect of X-rays and temperature, 428.
in sweet peas, 331.
of albino allelomorphs in rats and mice, 129.
of dark-eye and color in mice, 523.
Linognathus piliferus, notes, 53.
Linseed—
meal and tankage, feeding value, Wis., 470.
meal, feeding value, Ind., 175; Iowa, 779.
meal, value for egg production, Mo., 471.
oil, irradiated, effect, 568.
varnishes and oils, free fatty acid in, 810.
Liothrips—
spp. on lilies, 858.
vaneeckei, notes, 52.
Lipins, effect on interchanges between cells, 822.
Lipoid phosphorus in blood, determination, 12.

Lithurgus apicalis, injury to telephone poles, 154.
Liver—
effect on blood regeneration, 867.
of rats, vitamin C persistence in, 866.
relation to carbohydrate metabolism, 461.
rôle inaction of insulin, 166.
vitamin C in, from chickens on scorbutic diet, 671.
Livestock—
arsenical poisoning, 380.
breeding, formalism in relation to genetics, 369.
diseases. (*See* Animal diseases.)
French colonial, exploitation, 167.
improvement, methods, U.S.D.A., 95.
interstate movement, regulations, U.S.D.A., 667.
judging, 397.
judging and selection, treatise, 867.
marginal production, 571.
marketing in France, 192.
marketing organizations in United States, 297.
mineral deficiencies in, 573.
mineral requirements, 309.
poisoning. (*See* Plants, poisonous, *and specific plants*.)
production on Belle Fourche Project, U.S.D.A., 390.
saving from starvation during droughts, U.S.D.A., 168.
statistics, 597.
(*See also* Agricultural statistics.)
transportation investigation, 268.
(*See also* Animals, Cattle, Sheep, *etc.*)
Living conditions on farms of Schoharie Co., N.Y., U.S.D.A., 692.
Lizards, Porto Rican, food of, 51.
Loess, composition, 418.
Loranthus—
pentandrus, notes, 153.
spp., notes, 148.
Louisiana—
Stations, notes, 196, 499.
Stations, report, 599.
University, notes, 196, 499.
Loxostege—
similalis. (*See* Webworm, garden.)
sticticalis. (*See* Beet webworm.)
Lucern. (*See* Alfalfa.)
Ludius spp. in Pacific Northwest, 363.
Lumpy jaw. (*See* Actinomycosis.)
Lung fat, effect on growth, 367.
Lungworms in foxes, treatment, 787.
Lupines—
decomposition in soil, 418.
solar energy used by, 508.
Luteal cells in fowl ovary, studies, 329.
Lygus pratensis. (*See* Tarnished plant-bug.)
Lysine, synthesis, 204, 261.
Machinery. (*See* Agricultural machinery.)
Macrosiphum urticae, parasite of, 260.
Madonna lily, production, U.S.D.A., 441.
Magnesia, toxicity, buffering effect of silica, 517.
Magnesium—
chemistry, manufacture, and use, 621.
effect of manure and irrigation, 218.
limestone, effect on sand-drown of tobacco, 735.
limestone for tobacco sand-drown, N.C., 854.
Maine—
Station, notes, 697.
University, notes, 197, 697.
Maize. (*See* Corn.)
Malacosoma spp. (*See* Tent caterpillars.)
Male fern, toxicology and use, 586.
Malnutrition, basal metabolism in, 458.
Malt—
amylase, isoelectric point, 106.
diastase, optimum pH, effect of temperature, 9.
Malta fever—
organism, relation to *Bacillus abortus*, 279.
studies, 381.
Maltose determination in presence of other sugars, 504.
Mammals—
predatory, and balance of nature, 251.
predatory, food predilections, 251.
sex determination and differentiation, 524.
(*See also* Animals *and specific kinds*.)
Mammary—
gland substance, effect on uterine function, 525, 526.
microflora, relation to cheese making, 581.
Man—
body temperatures, variations in, 884.
effect of tropical climate, 764.
inheritance of head form in, 629.
protozoa of, catalogue, 855.
varietal formation in, 628.
Manganese—
as cure for chlorosis of spinach, 819.
effect on nitrification of ammonia, 822.
occurrence and function, 310.
sulfate, fertilizing value, 517.
toxic action on sugar cane, 829.
Mangels—
analyses, Can., 135.
breeding experiments, 230.
fertilizer experiments, Can., 530.
v. dried beet pulp for cows, Can., 674.
variety tests, Can., 530; Minn., 130; N.Dak., 334.
Mangoes, cold storage, 538.
Manila hemp. (*See* Abaca.)
Mantis, praying, parasite of, 157.
Manure—
decomposition, effect on soil potash, Wis., 415.
decomposition in soil, 418.
displacement by mineral nitrogenous fertilizers, 20.
effect of nitrifying bacteria, 821.
effect on calcareous soil, 218.

Manure—Continued.
liquid, nitrogen loss from, prevention, 514.
substitution by other fertilizers, R.I., 723.
time of application, U.S.D.A., 333.
Manures and fertilizers, treatise, 810.
(*See also* Cow manure.)
Maples—
hard, carbonization, dissolved tar from, 718.
sugar, translocation of carbohydrates in, 24.
sugar, volume of trees, Mich., 364.
Mares—
brood, wintering, Mo., 471.
inoculation to prevent joint ill in foals, 279.
Margarines, coconut and palm fats in, estimating, 806.
Margarodes hirsutissimus, description, 653.
Margaropus annulatus. (*See* Tick.)
Market—
gardens. (*See* Truck crops.)
prices, analysis, 294.
reports, U.S.D.A., 92, 392, 491, 691, 794.
Marketing—
agricultural products, bibliography, U.S.D.A., 91.
and financing agricultural products, effect on prices, 190.
cooperative—
and agricultural prices, 493.
in Canada, 91.
in United States, 598.
method of financing, 691.
relation to agricultural production, 895.
readings in, treatise, 694.
Marl excavating equipment, development, 588.
Maryland—
Station, notes, 600.
Station, report, 398.
University, notes, 600.
Mash feeder, description, Ohio, 892.
Massachusetts College, notes, 197.
Materials—
building, fundamental properties, 284.
heat conductivity of, tests, 285.
of construction, treatise, 284.
resistance of, treatise, 684.
strength, treatise, 185.
Mayetiola destructor. (*See* Hessian fly.)
Meadow soils, physical properties, 113.
Meadows. (*See* Hay, Grass, *and* Grassland.)
Mealie rust, life cycle, 245.
Mealybug, Comstock's, biology and control, Va., 756.
Mealybugs of economic importance in Hawaii, 658.
(*See also specific host plants.*)
Meat—
and meat products, foreign import duties on, 595.

Meat—Continued.
curing on the farm, 67.
export trade in South Africa, investigation, 268.
frozen, molds on, 657.
hygiene, textbook, 278.
irradiated, effect, 568.
marketing, retail, U.S.D.A., 491.
meal v. fish meal for poultry, N.C., 779.
military, and dairy hygiene, treatise, 783.
production and consumption in France, 167.
vitamin B in, 570.
(*See also* Beef, Pork, *etc.*)
Meats, export shipments, routing, 295.
Mechanics, popular, for farmers, handbook, 84.
Medicinal plants. (*See* Drug plants.)
Melanconium oblongum on butternut, 650.
Melanogaster ampelophila. (*See* Pomace fly.)
Melanoplus. (*See* Grasshoppers.)
Melinis minutiflora, toxicity to cattle tick, 156.
Melioidosis, relation to glanders, 678.
Meliola glabra, notes, 147.
Melipotis indomita, notes, 158.
Melon aphid, notes, Iowa, 755.
Melons, carload shipments of, U.S.D.A., 91.
Mercuric chloride, effect on seed germination, Colo., 146.
Mercurochrome—
changes in lung from use, 884.
for genito-urinary diseases, *783, 784.*
use, 677.
Merinus laevis larva and pupa, description, 557.
Meropleon cosmion, notes, 361.
Mesquite cutworm, notes, 158.
Metabolism—
and sex glands, 665.
basal—
effect of high temperature and humidity, 161.
effect of temperature and dress, Mo., 457.
in undernutrition, 458.
of girls, 862.
of obese subjects, 60.
treatise, 764.
effect of environmental temperature, 268.
in pregnancy, 365.
nitrogen, in fungi, 122.
of cattle during standing and lying, 271.
of man on prolonged diabetic diet, 562.
of rabbits on vitamin-free rations, 766.
of ruminants, studies, 663.
respiratory, of new-born babies, 366.
rôle of vitamin B in, 566.
Metal sliding over soil, friction between, 588.

Metals, use in agricultural machinery, tests, 286.
Metator spp., notes, 756.
Meteorological—
conditions and plant diseases, 613.
observations, Guam, 113, 413, 719; Mass., 413; N.Dak., 316; U.S.D.A., 210, 211, 508, 509, 718, 719; Wyo., 615.
observations at College of Agriculture, Philippines, 316.
observations in Madagascar, 615.
Meteorology, papers on, U.S.D.A., 210, 508, 718.
(*See also* Climate, Rainfall, Temperature, Weather, *etc.*)
Methylene blue reduction test—
papers on, 580.
standards, Wis., 411.
Mice—
irradiated, hereditary visceral abnormalities in, 833.
linkage in, 523.
litter size, birth weight, and growth, 627.
piebald, isolation of pattern variety in, 427.
(*See also* Rodents.)
Michigan—
College, notes, 97, 799.
Station, notes, 97.
Station, quarterly bulletin, 398, 798.
Microbracon, revision of genus, 861.
Micrococcus melitensis—
and *Bacillus abortus*, differentiation, 381, 886.
pathogenicity for rats and mice, 582.
Microorganisms—
effect on carbon-nitrogen ratio in soil, 818.
growth, effect of pH, 582.
implantation in intestinal tract, 200.
in cane juices, effect of filtration, 612.
iodine elimination and storage by, 202.
saprophytic, on plants, toxic action, 424.
transmitted hereditarily in tick, 783.
(*See also* Bacteria *and* Organisms.)
Microterys speciosus n.sp., life history and bionomics, 160.
Milk—
acidification with vinegar for infants, 867.
adulteration in France, 505.
analysis, methods, 715.
and its products, treatise, 581.
Babcock test as affected by adulterated acid, 109.
bacteria, new and corrected names, 881.
bacterial analysis, 581.
bacterial flavors and odors in, Iowa, 782.
bactericidal property, 474.
calcium and phosphorus in, effect of heat, 881.
certified and pasteurised, tests, 580.
Milk—Continued.
certified, relation to bacteriological standard, 880.
chlorinated, feeding to rats, 781.
clean, competitions in England, 176.
condensed, specific gravity determination, 314.
control, papers on, 270.
Cooledge pH test, practicability, 580.
cooling and storing, 580.
cost of production, Can., 674; N.C., 894.
dried and evaporated, comparison, 766.
dried, pellagra-preventive action, 662.
dry for school children, 659.
effect of protein substitutes, 673.
Evaporated, Association, fellowships, 200.
fat, constancy of melting and solidifying points, 276.
fat determination in dairy products, 315.
fat, determination methods, Conn. Storrs, 808.
fat quality, effect of oils in diet, 880.
fat, vitamin A in, 864.
fat, vitamin A oxidation in, 765.
fever, summary, Ill., 78.
flavor and odor, effect of garlic, U.S.D.A., 75.
flavor and odor, effect of green rye and cowpeas, U.S.D.A., 879.
food value, 580.
for cheese making, differences in quality, 276.
from stover-fed and silage-fed cows, nutritive value, Okla., 66.
germicidal action, 676.
growth promoting and antirachitic properties, effect of sunlight, 177.
heat coagulation, Wis., 411.
heat treatment, effects, Iowa, 776.
heated at different temperatures, pH of, 312.
houses for California dairies, Calif., 590.
human, analyses, Conn.State, 657.
in Berlin, vitamin C in, 265.
irradiated, effect, 568.
irradiated, value for rickets treatment, 661.
keeping quality, determination, 881.
keeping qualities, factors affecting, 276.
lactose in, determination, 110.
marketing for Chicago, Ill., 690.
mineral deficiencies, 564.
modified cow's, for orphan pigs, Iowa, 776.
nutritive value, as affected by heat, 67.
pasteurization, 178.
pasteurization methods, effect on digestibility, 881.
pasteurization, papers on, 580.
pH values, measurement, 12.
plants, papers on, 580.
plants, scientific control, 581.

Milk—Continued.
powder—
antiscorbutic potency, 165.
as affected by oxidation, reproductive potency, 565.
citric acid in, 505.
nutritive value, 866.
v. skim milk for pigs, Can., 872.
prepasteurized, relation to gastroenteritis in infants, 581.
problem of Boston, 580.
production—
economics of, 793.
effect of age of cow, 176.
hay v. alfalfa for, Wyo., 673.
Kellner's requirements, criticism, 673.
sources of protein for, Va., 578.
use of hay for, 377.
utilization of protein in, 274.
products, solids in, determination, 505.
raw and heated, detection, 206.
raw, safety, 178.
regulations for Buenos Aires, 474.
relation of solids to fat and specific gravity, Ill., 176.
relation to public health, 178.
sanitary, relation to utensils, 178.
sanitation, function of state, 580.
secretion, treatise, 72.
serving in schools, 580.
skimmed. (*See* Skim milk.)
solids, effect in ice cream, N.Y.State, 476.
sour, value for egg production, Mo., 471.
substitutes for calves, Mass., 475.
transportation by motor truck, U.S.D.A., 683.
turnip flavor in, 880.
use in cities, 580.
watered, detection, 505.
yield and composition, effect of change in diet, 571.
zinc and copper dissolved by, 277.
Millet—
culture, Nebr., 433.
hydrocyanic acid in, 571.
varieties, forage value, U.S.D.A., 132.
variety tests, Ariz., 733; Can., 530; N.Dak., 334; Wyo., 133.
Mineral—
deficiencies in livestock, 573.
deficiencies of milk, 564.
metabolism of farm animals, 369.
mixtures for fall pigs, Iowa, 775.
mixtures for pigs, Can., 870.
requirements for—
baby beeves, Ohio, 574.
dairy cattle, Mich., 879; Ohio, 580.
egg production, 273; Ind., 172; Ohio, 577.
soils, humic matter in, estimation, 503.
supplements, effect on growth and reproduction, 167.
Mineral—Continued.
waters, Swiss, iodine determination in, 201.
Minerals—
iodine content, 202.
utilization by pregnant ewes, Ohio, 574.
Minnesota—
Crookston Substation, report, 194.
Morris Substation, report, 195.
Station, report, 497.
Station, work of, 290.
Mississippi—
College, notes, 197.
Holly Springs Branch Station, report, 105.
Station, notes, 197.
Station, report, 398.
Station, South Branch, report, 299.
Missouri—
Poultry Station, notes, 300.
State Poultry Association, yearbook, 668, 660, 680, 681.
State Poultry Board, report, 669.
Station, notes, 197, 499.
Station, report, 497.
University, notes, 197, 499.
Mistletoe, monograph, 728.
Mistletoes—
on cultivated trees in Malaya, 148.
on rubber, 153.
Mocis repanda, notes, 156.
Moisture—
absorption in cotton, 634.
determination apparatus, 805.
effect on concrete, U.S.D.A., 84.
equivalent of soils, effect of storage, 722.
equivalent of soils, studies, 818.
Molasses—
as source of vitamin B, 660.
beet pulp. (*See* Beet pulp.)
fermentation, low yield of alcohol from, 811.
grass, toxicity to cattle tick, 156.
motor fuel from, 790.
pectin and pentosan content, 207.
Mold associated with abortion in cattle, 678.
Molds on frozen meat, 657.
Moles, trapping, Iowa, 755.
Monarthropalpus buxi. (*See* Boxwood leaf-miner.)
Monilia fructigena, notes, 43.
Monocrepidus bifoveatus, notes, 156.
Monotropa hypopitys, new glucoside in, 826.
Monotropitin, proposed name, 827.
Montana—
College, notes, 499.
Station, notes, 499.
Moor soils, nitrogen transformation, factors affecting, 118.
(*See also* Peat soils.)
Moors of northwestern Bohemia, 114.
Mormon farm village, social survey, 797.
Mormoniella spp., notes, 160.

Mosaic—
diseases, protozoa associated with, 646.
diseases, temperature studies, 646.
diseases, transmissibility and pathological effects, Iowa, 747.
diseases, types, 199.
inheritance, studies, 729.
(*See also specific host plants.*)
Mosquito larvae, toxic action of oil films on, 859.
Mosquitoes—
anopheline, identification of larvae, 559.
control, Conn.State, 450.
Moss destruction on lawns, Can., 340.
Moths in Sakhalin, 858.
Motor—
fuel from molasses, 790.
truck tire tests, U.S.D.A., 790.
truck transportation, U.S.D.A., 790.
trucks, air cleaners on, 485.
trucks, handbook, 187.
trucks, transportation of milk in, U.S.D.A., 683.
vehicle traffic, transverse distribution on paved roads, U.S.D.A., 83.
Motors, farm, treatise, 590.
Mottling disease of sugar cane. (*See* Sugar cane.)
Mount Rainier National Park, handbook, 744.
Muck soils, studies, N.C., 723.
Mucor, growth-promoting substance in, 766.
Mucor racemosus, studies, 753.
Mulberries, fertilization in China, 619.
Mung beans, crystals of vitamin B from, 503.
Muriate of potash. (*See* Potassium chloride.)
Musca domestica. (*See* House fly.)
Muscle—
effect on blood regeneration, 867.
fatigue and vitamin deficiency, 767.
Mushrooms, antiscorbutic properties, 62.
Muskmelon—
rust resistant strains, 543.
seed, germination studies, Colo., 146.
Muskmelons—
culture at Newlands, U.S.D.A., 840.
fertilizer experiments, Mo., 437.
shipments and unloads, U.S.D.A., 293.
Muskrats, raising, 376.
Mustard—
black, effect of calcium chloride, 121
seed in rape, detection, Iowa, 734.
Mutation—
chromosomal, in Datura, 226.
in tobacco, 831.
(*See also* Variation.)
Mutations, trisomic, of Oenothera, 127.
Mutilla quadriguttata, notes, 57.
Mutillidae, hyperparasitic on white grubs, 57.
Myasis, intestinal, and house fly, 454.
Mycobacterium tuberculosis and *Bacterium abortum*, mixed infection with, 885.
Mycosphaerella—
gossypina, notes, 351.
rubina, Phoma stage, importance, 650.
Myrmelachista ambigua ramulorum, control, 156.
Myzus—
cerasi. (*See* Cherry aphid, black.)
houghtonensis. (*See* Gooseberry witch-broom aphid.)
persicae-niger. (*See* Peach aphid, black.)
Naranga diffusa as rice pest, 857.
Nasonia spp., notes, 160.
National—
Canners Association research laboratory, report, 208.
Cleaner and Dyer book, 507.
Dairy Council, work of, 580.
forest ranges, cost and methods of carrying cattle, 168.
Forest Reservation Commission, report, 145.
Natural resources, conservation, 598.
Navel ill. (*See* Joint ill.)
Nebraska University, notes, 900.
Necrobia rufipes. (*See* Ham beetle, red-legged.)
Necrology, notes, 800.
Nectar glands of honey plants, structure, 324.
Nectarines, variety tests, Ariz., 741.
Nectria viticola, notes, 250.
Negro—
children, nutrition problem, Mo., 496.
farmers as owners, tenants, and croppers, 290.
Nematode genera, review, 553.
Nematodes—
migratory habits, 885.
new, from North American mammals, 553.
parasitic, effect of low temperatures, 482.
parasitic, from Indo-China, 760.
Nemicromelus fulvipes, synonymy, 160.
Nemorilla pyste, notes, U.S.D.A., 54.
Neoarsphenamine—
tests, 681.
use against blackhead in turkeys, 786.
Neocopidosoma, new genus, erection, 160.
Neocosmospora vasinfecta, notes, 351.
Neodiprion—
banksianae on jack pine, 861.
n.sp., studies, 453.
Neoleucopis luteicornis n.sp., description, 55.
Neoplasms in domesticated animals, 279.
Nephritis—
dietary control, 570.
in rabbits, studies, 889.
Nettle—
aphid, parasite of, 260.
stinging, analysis of seeds, Okla., 195.
Nevada Station—
notes, 600.
report, 497.

New Hampshire Station—
notes, 197.
report, 497.
New Jersey Stations, notes, 98, 900.
New Mexico Station—
notes, 98.
report, 195.
New York—
Cornell Station, notes, 197, 697.
State Station, notes, 197, 300, 698.
Nickel—
crucibles for alkali determinations, 714.
occurrence and function, 310.
Nicotiana tabacum, number of leaves and height, correlation, 331.
Nicotine—
dust hydrated mixtures, use against aphids, 359.
dust, use against apple aphid, 358.
dusts as insecticides, 755.
dusts, present status, 856.
soaps, studies, 254.
Niter spots, studies, Colo., 117.
Nitrate—
nitrogen leaching from soil, 117.
of ammonia. (*See* Ammonium nitrate.)
of soda. (*See* Sodium nitrate.)
Nitrates—
accumulation, effect of liming, 220.
determination, modification of Scales' method, 715.
loss from cropped soils, 723.
loss from soil, studies, 321.
movement in soil and subsoil, 721.
production in soil, factors affecting, 511; Mo., 414.
Nitrification—
effect of temperature, 817.
in peat soils, 118.
studies, 513.
Nitrifying—
bacteria, effect on manure, 321.
bed for prevention of nitrogen loss from liquid manure, 514.
Nitrogen—
activities in cultivated soils, 511.
ammoniacal, determination in soils, 10.
availability in nitrogenous materials under varying conditions, 619.
changes in black cotton soils, 618.
changes in soil, temperature factor in, 817.
determination, application of formol titration method, 610.
determination in fertilizers, methods, 804.
determination in soil, inhibition of bumping in, 409.
distribution in immature wheat kernel, 802.
fixation—
by Azotobacter in displaced solution, 215
by bacteria, effect of sugar concentration, 117.
Nitrogen—Continued.
fixation—continued.
by non-leguminous plants, Mich., 726.
effect of sugar on bacteria, 826.
in soil, studies, 721.
in calcium cyanamide, 611.
in leaves, effect of desiccation, 107.
in soils, rate of accumulation and cost, Mo., 414.
lime. (*See* Calcium cyanamide.)
loss from liquid manure, prevention, 514.
metabolism and sulfur, relation, 762.
metabolism in experimental scurvy, 164.
metabolism in fungi, 122.
mineral, in fertilizers, determination, 715.
of peat, absorption by crops, 322.
optimum form for crops, 20.
problem, trend of developments, 322.
product of seedling metabolism, 124.
requirement of cereals, R.I., 325.
source for Kentville, N. S., soils, 218.
Nitrogenous—
fertilizers—
availability, 219.
comparison, 119.
new, value, 322.
synthetic, value, 724.
toxicity to wheat sprouts, 20.
substances migration in yellowing leaves, 325.
Noctuid larvae, external morphology and postembryology, 55.
Nodule—
bacteria, disappearance from legume roots, 123.
bacteria, inoculating legumes with, 123.
bacteria, motility in soil, 232.
bacteria, studies, Mo., 415.
formation on non-leguminous plants, Mich., 726.
(*See also* Legumes, inoculation.)
Nomophila noctuella, notes, 559.
Noodles, phosphorus in, 807.
North America, geographical treatise, 397.
North Carolina Station—
notes, 198.
report, 798.
work and program, 899.
North Dakota—
College, notes, 98, 600.
Dickinson Substation, report, 398.
Station, notes, 98, 600.
Williston Substation, report, 599.
Northern Great Plains Station—
report, U.S.D.A., 195.
work of, U.S.D.A., 590.
Nosema—
adici, notes, 552.
bombycis, notes, 556.
"Nucleus disease," proposed name, 255.

Nurse, rural school, helps for, 95.
Nursery—
inspection, notes, Conn.State, 450.
stock, balled, fumigation, 453.
Nutmeg, California, artificial reproduction, 42.
Nutrients—
absorption at various depths, 825.
in subsoils, availability, 319.
Nutrition—
and foods, Government publications on, list, U.S.D.A., 260.
animal. (*See* Animal nutrition.)
laboratory, report, 364.
mineral elements in, 161.
net energy conception, 571.
plane of, effect on brood sows, Mo., 468.
plant. (*See* Plant nutrition.)
work for a community, 298.
Nysson hoplisivora, notes, 656.
Oak—
carpenter worm, lesser, life history and control, 358.
fungus in orchard trees, Calif., 754.
Oaks, American, monograph, 745.
Oat—
and pea hay, value for milk production, Can., 674.
and pea silage. (*See* Silage.)
bran, feeding value, 666.
crown rust, studies, Iowa, 746.
kernel, amino acids and polypeptides in, 501.
smut, control, 543; Wis., 443.
smut, covered and loose, studies, Ohio, 541.
smut, susceptibility of Fulghum-Swedish Select cross to, 349.
smut treatment, Minn., 149.
smuts, varietal susceptibility, U.S.D.A., 148.
Oats—
breeding experiments, 230.
Burt, variability in, 338.
chromosomes in, 829.
cost of production, U.S.D.A., 489.
crosses, susceptibility to smut, 349.
culture experiments, Mo., 431; U.S.D.A., 132, 333.
culture in Sweden, importance, 235.
culture in Värmland, Sweden, 633.
cutting tests, Can., 530.
fertilizer experiments, Can., 530; La., 514; Mo., 431.
fertilizer nutrients required by, 216.
immunity to wheat take-all, N.C., 747.
improvement, N.C., 835.
Kherson, variation in, 830.
nutrient requirements, R.I., 325.
optimum soil reaction for, 320.
prices, relation to transportation costs, 593.
rolled, irradiated, effect, 568.
rotation and tillage experiments, U.S.D.A., 528.
rotation experiments, Wyo., 133.
Oats—Continued.
seeding experiments, Can., 530; Minn., 130; N.C., 735, 835; Wis., 432.
solar energy used by, 508.
South Australian, analyses, 666.
sprouted, value for egg production, 670.
time of cutting tests, Minn., 131.
varieties, Calif., 430; Okla., 133; U.S.D.A., 132.
varieties for Kansas, 528.
varieties of Sweden, 835.
varieties, pedigreed, Iowa, 435.
variety tests, Ariz., 733; Can., 530; Ga., 230; Ind., 130, 431; La., 528; Minn., 130, 131; Mo., 235, 431; N.C., 734; N.Dak., 334, 529; N.Mex., 131; U.S.D.A., 134; W.Va., 31; Wis., 432; Wyo., 133.
Obesity, metabolism of, 60.
Ocnerostoma piniariella, notes, 257.
Odontionopa sericea, trapping, 257.
Oecophylla smaragdina of south China, 656.
Oenothera—
mutations, studies, 127.
segregation in, 330.
triploid hybrid, chromosomes of, 126.
Oestrous cycle—
and hysterectomy of opossum, 732.
effect of mammary gland substance, 525, 526.
in rats, studies, 832.
of cows, studies, 631.
Ogilvie, R. B., paper on, 571.
Ohio—
post road, condition, U.S.D.A., 483.
State University, notes, 99, 698.
Station, bimonthly bulletin, 899.
Station, monthly bulletin, 96, 599, 798.
Station, notes, 198, 698, 900.
Station, report, 599.
Oil—
crankcase, dilution, determination, 286.
crankcase, reclamation, 590.
emulsion, cold process formulas, 653.
emulsion for San Jose scale control, 454.
emulsion sprays, test, Mo., 437.
emulsions, new formula for, 452.
in flaxseed, determination, U.S.D.A., 611.
in oleaginous seeds, state of, 725.
meal. (*See* Linseed meal.)
palms, propagation, 344.
Oils—
animal and vegetable, statistics, 203.
drying, as adhesives in sprays, 453.
in diet, effect on composition of milk fat, 880.
in rations of cows, effect on butterfat, 377.
iodine number determination, 315.
lubricating, tests, 187.
miscible, and oil emulsions, 452.
mixing with hard waters and lime-sulfur solutions, 254.
(*See also* Fats, Cottonseed oil, *etc.*)
Oklahoma Station, report, 195.

Oleoresin—
of *Douglas fir, composition*, 811.
production, effect of height of chipping, 346.
Olethreutes spp., notes, 652.
Olive—
disease, notes, 246.
fly control, papers on, 156.
fly in Palestine, 654.
trees, pruning experiments, Ariz., 741.
Olives—
canned ripe, survey, 50.
Corsican, composition, 562.
for oil, preservation, 507.
insects affecting, 157.
pruning, 844.
Oncodes costatus, egg-laying experience with, 154.
Onion—
maggot, control, 362.
maggot, notes, Iowa, 755.
mycelial neck rot, 351.
scales, juice extracted from, toxicity, 348.
seeds, domestic and foreign production, statistics, 240.
smut, control, 44.
smut disease, history and control, Mass., 444.
thrips, dusting experiments, Conn. State, 450.
Onions—
breeding experiments, Ind., 130.
culture at Newlands, U.S.D.A., 840.
marketing, U.S.D.A., 690.
raw, test for worms in dogs, 385.
root development, 342.
shipments and unloads, U.S.D.A., 293.
storage, Ariz., 741.
Ontario Veterinary College, report, 278.
Oospora scabies. (See Potato scab.)
Ophiobolus cariceti—
heterothallism in, 627.
studies, N.Y.Cornell, 348.
Ophthalmia—
as symptom of dietary deficiency, 63.
in rats on vitamin diets, 767.
in turkeys, 578.
Ophthalmoplegia, congenital, recessive form, 629.
Opossum—
ovariotomy in, effect, 429.
ovary, compensatory hypertrophy of, 732.
sex-intergrade, analysis of gonads, 631.
Orange—
juice, antiscorbutic value after cold storage, 667.
juice, commercially concentrated, antiscorbutic value, Calif., 458.
pectin, analyses, U.S.D.A., 13.
protein, studies, 711.
rusts, distribution, 854.
trees, shy-bearing, treatment, 841.
Oranges, storage, 844.
Orchard—
heaters, value to peaches, N.Mex., 140.
inspection. (*See* Nursery inspection.)
Orchards—
commercial, developing, Ohio, 39.
soil management, Iowa, 741.
(*See also* Fruits, Apples, Peaches, *etc.*)
Orchelimum, material for chromosome study, 226.
Orchestes fagi, larval mines of, 860.
Orchestini, larval mines of, 860.
Orchid chalcid, life history and control, 362.
Orchidaceae, symbiosis in, 726.
Organic—
compounds—
carbon determination in, 805.
irradiated, impartation of antirachitic properties, 568.
synthetic, 204.
evolution and heredity, treatise, 627.
matter in soil, decomposition, effect of fineness of limestone, 323.
matter in soil, solubility, effect of drying, 19.
microanalysis, treatise, 714.
Organisms—
filtering out, apparatus and technique, 25.
living, treatise, 627.
(*See also* Bacteria *and* Microorganisms.)
Organization in industry, commerce, and the professions, 398.
Oriental fruit moth, summary, 360.
Oriental peach moth. (*See* Peach moth.)
Ornamental plants, shrubs, and trees. (*See* Plants, Shrubs, and Trees.)
Ornithodorus megnini, summary, 657.
Orphans, physical fitness for, 563.
Orterde, formation, 115.
Orthezia yasushii n.sp., notes, 158.
Ortheziinae, classification, 359.
Oryza—
sativa germination, effect of X-rays, 519.
sylvestris as weed in Belgian Kongo, 830.
Oscinis frit, notes, N.Dak., 652.
Osiraspis, new genus, erection, 53.
Osteomalacia, relation to diet, 460.
Ostertagia bisonis from a stomach and duodenum of buffalo, 553.
Ova, unfertilized, degenerative changes in, 732.
Ovarian follicular hormone—
localization and action, 526.
secretion by corpus luteum, 834.
Ovaries—
of *fowls, histological studies*, 329.
of opossum, compensatory hypertrophy of, 732.
of sow, selective elimination of ova, 732.
Ovariotomy—
in fowls, sex reversal *following*, 832.
in opossum, effect, 429.

Oviduct of hens, chemical studies, 876.
Ovulation and corpus luteum extracts in rabbits, 833.
Ox brain, copper determination in, 206.
Oxalis rust, life cycle, 245.
Oxides, insoluble, action on potato late blight, 545.
Oxygen—
consumption, apparatus for recording, 206.
upper critical concentration in root growth, 421.
Oysters—
as cause of typhoid epidemic, 267.
decomposing, microorganisms in, 761.
Oyster-shell scale—
on shade trees, Colo., 154.
relation to predatory mite, 260.
Ozonium omnivorum—
life history, 544.
notes, Ariz., 745.
Pachyrrhynchides, monograph, 759.
Paddy. (*See* Rice.)
Paint—
law and regulations of North Dakota, 389.
tests, 389.
Painting on the farm, U.S.D.A., 287.
Palm—
African oil, bent-leaf disease, 148
bud rot, notes, 43.
coconut. (*See* Coconut.)
Palms—
date, spraying, Ariz., 745.
oil, propagation, 344.
Pamphigus betae, notes, Utah, 254.
Pandora moth, notes, 857.
Panicum repens as weed in Belgian Kongo, 839.
Panolis flammea and parasites in Poland, 53.
Papago Country, Arizona, reconnaissance, 890.
Papaipema nitela. (*See* Stalk borer.)
Papaya ovules, pistillody of, 424.
Paper mulch, use in cotton culture, Ga., 230.
Paradichlorobenzene, danger in use of, 158.
Paragus tibialis, notes, 557.
Paranasal sinuses of bovines, 182.
Parasa hilarata larva, irritating properties, 859.
Parasites of Philippine ruminants, 855.
(*See also specific parasites.*)
Parasitological investigations, laboratory methods, 584.
Paratetranychus pilosus. (*See* Red mite, European.)
Parathyroid—
hormone, effect on normal dogs, 564.
tetany, control, 563.
Paratyphoid—
dysentery in lambs, Colo., 179.
fever outbreak, 166.
Paresis, parturient. (*See* Milk fever.)
Parsnip webworm, notes, 559.
Parthenogenesis in mammals, possibility, 732.
Pasteurella boviseptica, studies, 887.
Pasteurization. (*See* Milk.)
Pasture and dry lot feeding for pigs, Can., 871, 873.
Pastures—
basic slag and mineral phosphates for, 515.
carrying capacity, U.S.D.A., 168.
fertilizer experiments, Ind., 431; N.H., 432.
studies, Can., 530; Ind., 130.
(*See also* Grasses, Grassland, *and* Meadows.)
Pavements. (*See* Concrete *and* Roads.)
Pea—
aphid, control, Wis., 451.
aphid, dusting experiments, Conn.State, 450.
blight, notes, 43.
oat, and vetch silage. (*See* Silage.)
root rot, studies, 351.
root rot, survey, Wis., 443.
seeds, changes during growth and ripening, 240.
(*See also* Peas.)
Peach—
acids, nonvolatile, 105.
aerial galls, 649.
aphid, black, control, Ohio, 555.
bacterial shot hole, notes, 549.
brown rot, notes, 43.
diseases in Illinois, 547.
moth, oriental—
as quince pest, 360.
bait for, 360.
control, 859.
habits and control, Conn.State, 450.
in New Jersey, 360; N.J., 53.
life history, habits, and control, 755.
notes, Ind., 454; Ohio, 798.
studies, 653.
summary, 51.
rust, notes, 43.
trees, water requirements, Ariz., 741.
trees, winter injury, Ga., 239.
twig borer in British Columbia, 250.
Peaches—
breeding experiments, U.S.D.A., 141.
"cat faced," cause, Ind., 154.
dry-mix spray for, Va., 40.
fertilizer tests, 398.
pollen abortion in, 39.
pruning effects, Ind., 139.
pruning experiments, Miss., 239.
rest period in, 124.
shipments and unloads, U.S.D.A., 293.
spray schedules for, Mich., 37; N.J., 37.
spraying and dusting, Conn.State, 442.
spraying experiments, Okla., 141.
thinning, Colo., 143; Okla., 141.
variety tests, Ariz., 741.
Peanut meal, feeding value, Va., 578.

Peanuts—
biological notes, 236.
effect on soft pork, N.C., 775.
treatise, 236.
Pear—
blight, notes, 43.
blight treatment, Calif., 448.
diseases in Illinois, 547.
Phytophthora rot, 549.
scab, control, 548.
Pears—
Bartlett, conductive tissues in shoots, Calif., 324.
effect of fertilizers on form and size, 536.
fertilizer experiments, Can., 840.
pollination, 641.
propagation studies, U.S.D.A., 141.
spray schedules for, Mich., 37.
time of pruning, Can., 840.
varieties in Wyoming, 536.
variety tests, Ariz., 741.
winter protection, U.S.D.A., 141.
Peas—
and oats, seeding experiments, Wyo., 133.
and potatoes, seeding experiments, Wyo., 133.
fertilizer experiments, La., 514; Miss., 341.
field, cooking tests, Can., 530.
genetics of, new observations on, 331.
seed, production in Montana, Mont., 236.
seeding experiments, Wyo., 133.
Tangier, studies, Calif., 737.
variety tests, Ariz., 741; Can., 530; N.Dak., 334; Wis., 432; Wyo., 133.
Peasant industry, principles of, treatise, 207.
Peat—
biological studies, 610.
nitrogen, absorption by crops, 322.
soils, fertilization, Wis., 416.
soils, water level, relation to penetration of corn roots, 18.
(*See also* Moors.)
Pecan—
nut case-bearer, life history, 361.
nut case-bearer, studies, U.S.D.A., 54.
rosette, notes, 43.
trees, fertilizer experiments, 538.
Pecans—
culture experiments, N.Mex., 242.
insects affecting, 755.
production in 1923, N.Mex., 140.
variety tests, Ariz., 741.
Pectin—
chemistry and industrial applications, 105.
determination in juices and removal, 207.
extraction and clarification, Oreg., 810.
from citrus peel, preparation, U.S.D.A., 13.
solutions, jellying, 209.
Pectinophora gossypiella. (*See* Bollworm, pink.)
Pediculus. (*See* Lice.)
Pedigree register, particulars necessary, 260.
Pegomyia—
brassicae. (*See* Cabbage maggot.)
hyoscyami, notes, Utah, 254.
Pellagra—
dietary factors in, 662.
yeast treatment, 662.
Penicillium—
roseum, notes, 43.
sp., notes, 850.
spp. on citrus, control, 354.
Pennsylvania—
College, notes, 99, 198, 600, 799.
Station, notes, 99, 198, 600.
Penthaleus destructor, notes, 657.
Pentosans determination in juices and removal, 207.
Pentoses—
orcinol reaction, extension coefficients of, 205.
spectrophotometric determination, 205.
Pepper—
cress grown in salt water, effects, 626.
diseases, control, 852.
diseases, notes, Ga., 246.
Perapabrus scabricollis. (*See* Cricket, coulee.)
Perfumes, variation due to grafting, 627.
Peridermium strobi. (*See* White pine blister rust.)
Perissopterous mexicanus, notes, 160.
Permeability—
and plasmolysis, 422.
in plant cells, 822.
Peromyscus cremicus, subspecific hybrids, pigmentation studies, 428.
Peronea maximana, notes, 859.
Peronoplasmopara cubensis, notes, 43.
Peronospora, monographic account, 542.
Pestalozzia—
palmarum, notes, 148.
sp. on *Cinnamomum camphora*, 650.
Petroleum oil, arsenated, as wood preservative, 812.
Phanurus promachivorus n.sp., description, 561.
Pheletes occidentalis in Pacific Northwest, 363.
Phenacoccus iceryoides, notes, 55.
Phenacomys olympicus, Alpine life of, 50.
Phenological—
observations in Netherlands, 813.
observations in United States and Canada, 508.
research, international cooperation in, 814.
Phenylalanine, decomposition, 310.
Phlox eelworm disease, studies, 49.
Phlyctaenia—
tinicola, notes, 851.
rubigalis, control, 360.
rubigalis, notes, 559.

Pholiota adiposa, growth reaction toward acidity, 224.
Phoma—
betae, notes, 47, 248.
sp., notes, 43, 152.
Phomopsis—
californica, notes, Calif., 449.
citri, studies, 650.
Phorbia cepetorum. (*See* Onion maggot.)
Phormium, international trade, 296.
Phosphate deposits—
of Russia, 515.
origin, 620.
Phosphates—
comparison, 120; Ind., 420; Ohio, 217.
in blood, determination, 12.
preparation and treatment, 620.
profits from, Wis., 621.
Reform, fertilizing value, 120.
relation to carbohydrate metabolism, 763.
Rhenania, fertilizing value, 120.
rock, fertilizing value, 120.
(*See also* Phosphates, comparison.)
rock, residual effects, 620.
rock, value for pastures, 515.
solubilization by bacteria, 322.
solubilization, studies, 514, 722.
use, Wis., 416.
Phosphatic—
materials, analysis, sources of error in, 804.
slag, fertilizing value. (*See* Phosphates, comparison.)
slag, value for pastures, 515.
Phosphatide of egg yolk, irradiated, effect, 568.
Phospho-manganese, fertilizing value, 819.
Phosphoric acid—
determination, Copaux method, 313.
determination in fertilizers, 109.
determination in plant materials, 314.
determination, sources of error in, 611.
effect on nitrogen transformation in moor soils, 118.
fertilizers, new, tests, 120.
free, determination in fertilizers, 804.
soluble, retention in soils, 213.
sources for tomato, 639.
Phosphorite beds in Russia, 515.
Phosphorus—
and calcium metabolism, factors affecting, 364.
availability, effect of liming, 220.
deficiency, effect of ultraviolet radiations, 763.
determination, effect of ammonium sulfate, 205.
in cattle feeds, nutritive value, 867.
in soil, effect of manure and irrigation, 218.
lipoid, in cereal products, 807.
metabolism in osteomalacia, 460.
natural solvents of, 620.
Phosphorus—Continued.
requirement of cereals, R.I., 325.
reuirements of human body, 161.
solubility, factors affecting, 515.
source for Kentville, N.S., soils, 218.
Photometers and photometric methods, 824.
Photosynthesis—
and use of solar energy, 15.
rays of various colors in, specific action, 727.
studies, 821.
Phototropism, effect of gravity in, 727.
Phthorimaea operculella. (*See* Potato tuber worm.)
Phyllophorinae, monograph, 556.
Phyllosticta—
antirrhini, notes, 550.
solitaria, life history and control, Ill., 353.
solitaria, time of infection, 649.
Physalospora—
baccae on grape in Japan, 151.
cydoniae, notes, Mass., 446.
Physics, treatise, 386.
Physopella vitis, notes, 43.
Phythium debaryanum, notes, 248.
Phytol and vitamin A, 10, 408.
Phytometer method, application, 824.
Phytonomus posticus. (*See* Alfalfa weevil.)
Phytonucleic acid, effect on Azotobacter, 25.
Phytophaga destructor. (*See* Hessian fly.)
Phytophthora and Pythium merging into one genus, 645.
Phytophthora—
cactorum, notes, 549; Ill., 355.
faberi, notes, 549.
infestans. (*See* Potato blight, late.)
palmivora on coconut palms, 49.
sp., control, 147.
sp., notes, 148, 153.
Phytoptus oleivorus, notes, 157.
Phytosterol, irradiated, antirachitic value, 568, 767.
Pieris—
brassicae eggs, parasite of, 57.
brassicae larva, new disease of, 255.
rapae. (*See* Cabbage worm.)
Pig farms, home-made labor saving devices for, Mo., 287.
Pigeon grass seed, feeding value, 68.
Pigeons, sex in, relation to blood calcium, 672.
Pigmentation, increased, in hens and anemia, 81.
(*See also* Anthocyanin and Color inheritance.)
Pigs—
age and weight, relation to gains in nutrients, 570.
breeding, age as factor in, Mo., 468.
crossbred, cost of feeding, Can., 872.
digestion experiments, 667.
fall and spring farrowed, 571.
fall, production in Alberta, 868.

Pigs—Continued.
feeding experiments, 373; Ariz., 773; Can., 870, 871, 872, 873; Guam, 468; Iowa, 774; Kans., 370; Minn., 170, 171, 469, 575; Mont., 70; N.C., 775; Ohio, 470, 575; Okla., 171; U.S.D.A., 371, 870; Wis., 470; Wyo., 668.
fitting, showing, and judging, U.S.D.A., 873.
inter and intrastate shipment, 170.
interstate shipment, 78.
orphan, raising, Iowa, 776.
prices, factors affecting, Nebr., 593.
prices in Ohio, 895.
production in Switzerland, 576.
production in Tunis, 272.
raising, elementary principles, 374.
ratio of births and slaughter, 167.
rations for, 571; Okla., 66.
roundworms in, Wis., 479.
sex-intergrade, genital organs, 631.
stiffness in relation to diet, N.Y.Cornell, 69.
type test, Iowa, 775.
vitamin A requirements, 571.
vitamin requirements, Ind., 167.
Yorkshires v. Berkshires, Can., 872.
(*See also* Swine.)
Pilacre faginea, life history, 530.
Pin hole borer in Western Australia, 860.
Pine—
beetles, discussion, 655.
blister rust. (*See* White pine blister rust.)
hardwood forests, effects of fire, Ohio, 745.
leaf miner, European, notes, 257.
Monterey, reversible variations and sap movement, 624.
Monterey, stem analysis, 823.
moth, life history, 652.
needle mite, notes, 801.
oil films, toxic action on mosquito larvae, 859.
red and white, effect of wind and exposure, 441.
sawfly, studies, 453.
Scotch, pruning in state forest of Sweden, 346.
Scotch, seed germination, 539.
seed, red, gathering and extracting, 41.
seedlings, malformation of root systems, 126.
western yellow, forms and ranges of bark beetles and mistletoe, 145.
western yellow, sowing and planting season, 345.
white. (*See* White pine.)
Pineapple—
industry in Bataan Province, 744.
mealybug, enemies of, 653.
Pineapples—
fertilizer experiments, Guam, 436.
fertilizer requirements, 644.
Pink bollworm. (*See* Bollworm, pink.)
Pinks, *Vermicularia herbarum* affecting, 40.
Pionea sp., notes, 558.
Piricularia grisea, notes, 246.
Piroplasma ovis n.sp., notes, 481.
Piroplasmoses of sheep in Algeria, 183, 481.
Pisé de terre, use in building construction, 390, 891.
Pistillody of papaya ovules, 424.
Placenta, retained, sequelae in cows, 278.
Plague transmission by fleas, 758.
Plane tree mildew, notes, 43.
Plant—
breeding in Porto Rico, 141.
breeding methods, 230.
(*See also* Heredity, Hybridization, *and specific plants.*)
cell structures, effect of electrical stimulation, 323.
cells, permeability in, 522.
cells, reactions to colorants, 521.
cells, starch formation and digestion, 826.
cells, sugar metabolism in, 826.
(*See also* Cells.)
chromosomes. (*See* Chromosomes.)
diseases—
and meteorological conditions, 813.
control by seed treatment, 43.
of New Mexico, control, N.Mex., 847.
studies, Ga., 246.
virus, economic significance, 245.
virus, studies, 43, 244, 245.
See also Fungi *and different host plants.*)
ecology, studies, 823.
families, chromosomal survey, 828.
growth—
and acidity, 125.
and heliotropism, 623.
and physical principles, 518.
growth, effect of—
aluminum and acids, 326.
drought, 423.
electricity, 222.
hydrocyanic acid, 829.
light and temperature, 222.
sawdust, 121.
seed weight, N.J., 23.
growth of massive organs, 517.
histology methods, treatise, 420.
inspection. (*See* Nursery inspection.)
movements, developmental, treatise, 324.
names, standardized, 122.
nutrition, effect on susceptibility to toxic substances, 224.
nutrition, studies, Calif., 420.
pathology laboratories, new, at Rothamsted, 200.
pathology publications, index, U.S.D.A., 846.
physiology, treatise, 628.
pigmentation. (*See* Anthocyanin.)
production, effect of titanium, 22.

Plant—Continued.
protection research, operation of poison in, 43.
protoplasm necrobiosis, studies, 521.
pulp, effect on chemical conditions in media, 223.
pulps, absorption of acid, alkali, and enzyme by, 223.
sciences, International Congress, 699.
species, origin and geographical distribution, 225.
tissue—
arsenic determination in, U.S.D.A., 327.
carbohydrates in, effect of drying, 803.
composition, effect of desiccation, 107.
isoelectric point for, Mo., 442.
study, micro-technique for, 224.
tissues, hydration and swelling, 822.
Plantations, permanent, in Tropics, exchange value, 689.
Plants—
action of chlorides on, 21.
adaptation to length of daily light period, 518.
alkaloids in, biological significance, 826.
assimilation of ammonia by, 726.
at different stages, feeding experiments on rats, 766.
book of, for elementary schools, 694.
bulbous, dextrin reserve in, 519.
carbohydrates in, determination, 108.
creeping, studies, 623.
cultivated under glass, modifications, 520.
culture in sterile liquid medium, 827.
desert. (*See* Desert.)
drought resistance of, 518.
effect of boric acid, 26.
effect of formaldehyde, 326.
effect of hexamethylenetetramine, 326.
feeding power in different soil horizons, 815.
greenhouse, diseases, 550.
growing in saline media, persistence of characters, 521.
imports, U.S.D.A., 728.
improvement methods, 522.
injury from toxic concentrations, effect of nutrition, 224.
leaf injuries, effect on production of dry matter, 727.
medicinal. (*See* Drug plants.)
non-leguminous, nodule formation in, Mich., 726.
nuclear division, effect of ultra-violet light, 423.
of South Africa, transpiring power, 823.
ornamental—
culture, Can., 340, 840.
culture experiments, Minn., 189.
Plants—Continued.
ornamental—continued.
extension work with, U.S.D.A., 695.
tests, U.S.D.A., 141.
permeability. (*See* Permeability.)
photosynthesis. (*See* Photosynthesis.)
poisonous, of France, 582.
poisonous, of Michigan, 783.
poisonous, on cattle ranges, Nev., 478.
pollination. (*See* Pollination.)
regeneration in, 124.
respiration. (*See* Respiration.)
response of roots to aeration, 222.
seedling metabolism, nitrogen as product of, 124.
sex determination and differentiation, 524.
transpiration. (*See* Transpiration.)
variability and segregation in, 330.
vegetative growth, effect of fruit, 142.
water cycle in, 824.
water movement in, dynamics, 624.
young, period of toxicity of fertilizers for, 21.
Plasmolysis and permeability, 422.
Platybothrus brunneus, notes, 756.
Plectodiscella veneta, control, Mich., 354.
Pleurotus ostreatus, growth reaction toward acidity, 224.
Plowing—
deep, experiments, Ill., 17; Ohio, 17.
dynamometer tests at Potchefstroom, 790.
electricity for, 389.
Plowrightia solanicola n.sp., description, 46.
Plows—
design, fundamentals, 685.
draft of, Iowa, 788.
draft of, soil factors affecting, 286.
effect of location of knife colter, 85.
Plum—
curculio on peaches, N.C., 755.
seeds, late stratification, effect, 641.
trees, effects of sod in relation to moisture and nitrates, N.Y.Cornell, 642.
Plumb, Professor, as teacher, 571.
Plums—
breeding experiments, U.S.D.A., 141.
effect of cultural treatments, U.S.D.A., 141.
propagation, stocks for, U.S.D.A., 141.
pruning effects, U.S.D.A., 141.
spray schedules for, Mich., 37.
time of pruning, Can., 840.
varieties in Wyoming, 536.
variety tests, Ariz., 741.
winter injury, 125.
Pneumococci, preserving, hormone blood agar for, 582.
Pneumonia associated with *Bacillus abortus*, 785.
Podsol soils, effect of excessive liming, 621.
Poisonous plants. (*See* Plants, poisonous.)
Poisons, stomach, for caterpillars, action, 52.

Polistes, mating habits, 856.
Pollen—
carrier, determination, 425.
grains, vacuome in, 520.
Pollination, experimental, 728, 824.
(*See also specific plants.*)
Polychrosis botrana, studies, 656.
Polygonum—
convolvulus in grain seed, 36.
lapathifolium in grain seed, 36.
Polypeptides—
in corn kernel, 502.
in oat kernel, 501.
in rye kernel, 712.
Polyporus adustus, growth reaction toward acidity, 224.
Polyspora lini, notes, 246.
Polystictus versicolor, growth reaction toward acidity, 225.
Polysulfides in sprays, estimating, 506.
Pomace flies, hereditary tumors in, 28.
Pomace fly, minute-like III-chromosome recessive in, 729.
Pomology, systematic, treatise, 37.
Pond, farm, dam and spillway for, 83.
Popillia japonica. (*See* Japanese beetle.)
Poppy, fertilizer experiments, 625.
Pork—
from home-grown feeds and farm by-products, 70.
home cured, 71.
production in Sweden, 668.
production, sunlight as factor, Wis., 463.
(*See also* Pigs.)
soft, studies, Ga., 272; N.C., 775.
Porthesia similis, notes, 558.
Porthetria dispar. (*See* Gipsy moth.)
Porto Rico Insular Station, report, 195.
Potash—
absorption by humic acid, 420.
availability, effect of manure, Wis., 415.
deposits of southwest Texas, 516.
effect on nitrogen transformation in moor soils, 118.
leaching from soil, 117.
recovery from Steffen waste water, 322.
soil, effect of cropping, Tex., 617.
subsoil, availability, 214.
tests on potatoes, N.H., 432.
Potassium—
chloride, fertilizing value, Ohio, 217.
iodine feeding for pigs, Iowa, 777.
permanganate, use in drinking water for poultry, 682.
requirement of cereals, R.I., 325.
salts, crop response to, 724.
salts, effect on ewes, Iowa, 768.
supply of soil, factors affecting, 516.
Potato—
anthracnose, biology, 46.
Association of America, proceedings, 634.
beetle, Colorado, spread in France, 159.
Potato—Continued.
black wart in British Isles and Europe, 546.
black wart, resting spores, in soil, 46.
blackleg, studies, Mich., 751.
blackleg, transmission by seed-corn maggot, 545.
blight, early, in Bermuda, 852.
blight, late, action of insoluble oxides on, 545.
blight, late, control, effect of spray pressure, N.H., 445.
blight, late, notes, 46.
breeding, methods, 628.
canker in Germany, distribution, 352.
canker organism, relation to host, 46.
curl, studies, 244.
degeneration diseases, 544, 648; U.S.D.A., 45; Vt., 853.
degeneration diseases, effect of environment, Nebr., 351.
diseases in Dutch East Indies, 46.
diseases, virus, studies, 245.
giant hill disease, studies, Vt., 853.
leaf roll on seedlings, 248.
leaf roll, protozoa associated with, 646.
marginal leaf roll, description, 648.
mosaic—
in Northwest, 648.
masking at high altitudes, 648.
new host for, 648.
notes, 46.
on seedlings, 248.
temperature studies, 646.
plant characters, 532.
planters and diggers, description, 390.
plants, nutrition in water culture, 221.
premature desiccation, 45.
scab control, Minn., 150.
scab, effect of soil moisture and acidity, 546.
spindle tuber disease, 648; Nebr., 445.
storage rots, studies, 45.
tuber worm in France, studies, 653.
tubers, cutting, 236.
tubers, germinability, relation to soundness and yield, 45.
tubers, number and size, effect of fertilizers, 635.
tubers, stem-end discolorations, causes, 852.
verticilliose, notes, 546.
Potatoes—
breeding experiments, 230.
breeding methods, Minn., 425.
certification, N.C., 835.
certified seed, comparison, La., 528.
certified seed, importance, 529.
certified strains, notes, Conn.Storrs, 737.
cold storage of, Mo., 431.
cost of production, U.S.D.A., 489.
cultivation tests, Minn., 131; Okla., 133.
culture in California, Calif., 532.
culture in Ohio, 636.
digestibility by fowls, 172.

Potatoes—Continued.
dormancy abbreviation, 636.
Dutch disease resistant varieties, 852.
effect of climate, N.H., 431.
effect of early and late planting and sprouting, Can., 187.
Ekishirazu, in New York, 852.
feeding value, Can., 870.
fertilizer experiments, 30, 142, 218; Can., 530; Minn., 131.
genetics of, 628.
hot water and hot air treatment, effect, 853.
late, time for planting, Mich., 339.
New York, marketing, N.Y.Cornell, 794.
optimum soil reaction for, 320.
physiological shrinkage, 635.
planting experiments, Ariz., 733; Md., 332.
pollination studies, 128.
potash for, N.H., 432.
production and marketing, Mich., 91.
renewed growth due to grafting, 519.
respiration, relation to storage and transportation, 636.
running out, causes, Ohio, 541.
seed—
certification, 635.
certified, Ohio, 96.
improvement, 634.
mosaic-free, production, Wis., 443.
of same variety, variations in yield, 635.
production, 837.
production, effect of soil type, 635.
spring-grown, value, Ariz., 734.
treatment, Mo., 431.
seeding experiments, Can., 530; U.S.D.A., 834.
shipments and unloads, U.S.D.A., 293.
solar energy used by, 508.
spacing and selection tests, U.S.D.A., 528.
spraying, N.C., 755.
spraying and dusting, 853; Conn. State, 442; Ohio, 46, 541.
spraying experiments, Ariz., 746; Minn., 131; N.H., 431.
standard grades, Mich., 798.
statistics, U.S.D.A., 92.
storage in India, 45.
tuberization, chemical changes, 635.
variation during growth and storage, 338.
variety tests, Ariz., 733; Can., 530; Md., 332; Minn., 130, 131; N.Dak., 334, 529; U.S.D.A., 528, 834; Wyo., 138.
yield and market quality, Mich., 339.
yield, factors affecting, Can., 530; Conn.Storrs, 751.
Poultry—
body temperature, 183.
body weight and egg production, N.J., 877.
breeding for egg production, 332.
Poultry—Continued.
breeds, American and foreign, 71.
breeds, descriptions, 671.
clam and oyster shells for, value, Iowa, 778.
clubs, constitution and by-laws for, 695.
diseases in New York, 183.
diseases, studies, 680, 681, 786; N.C., 786.
(*See also specific diseases.*)
economy of standard type in, 273.
excreta, uric acid in, 503.
experiments, Ind., 172; Mo., 471; N.Mex., 178; Okla., 173.
farming, principles, treatise, 174.
feeding experiments, 374, 669, 670; Can., 874; Iowa, 778; Ohio, 576.
(*See also* Chicks *and* Hens, laying.)
feeds, digestibility, 375.
feeds, effect on hatchability and egg production, Ohio, 873.
feeds, Philippine, studies, 374.
green feed for, value, N.J., 72.
houses—
and equipment for Texas, 86.
construction, 487, 892; Wash.Col., 288.
modern fresh-air, 274.
plans and construction, Idaho, 86; Mont., 791.
housing in Florida, 274.
industry in Connecticut, 576.
inheritance of body-weight in, R.I., 629.
inheritance of rate of feathering, 427.
intestinal worms, Wis., 479.
Leghorn, inheritance of fecundity in, N.J., 29.
lice, control, 681.
mortality, classification, 786.
nutrition, effect of ultraviolet light, Me., 375.
production, sunlight as factor, Wis., 463.
products, marketing, treatise, 397.
Rhode Island Red, cost of raising, N.C., 793.
sex-linked inheritance in, 877.
shows, financing and managing, 695.
vitamin A deficiency in, Calif., 477.
(*See also* Chickens, Ducks, Fowls, *etc.*)
Power, human, maximum, and its fuel, 863.
Prairie dogs—
destruction, Okla., 155.
destruction of range by, 824.
Precipitation. (*See* Rainfall.)
Pregnancy—
effect on metabolism of goat, 664.
metabolism in, 365.
Preservatives, use in food, 160.
Price—
movements, effect on agriculture, 895.
spreads, U.S.D.A., 294.
Prices—
farm, index numbers, types, 92.

Prices—Continued.
index numbers, Ohio, 898.
market, analysis, 294.
science of, treatise, 898.
stabilization, relation to organization of agriculture, 190.
Prionoxystus macmurtrei, life history and control, 358.
Prociphilus erigeronensis, life history, Ohio, 555.
Prodenia litura, notes, 558.
Prontaspis yanonensis on oranges in Japan, 158.
Proso, variety tests, N.Dak., 334.
Prospaltella as egg parasite of codling moth, 861.
Protein—
chemistry, recent advances in, 105.
in edible portion of orange, 711.
metabolism, effect of muscle work, 762.
requirements of heifers, Mo., 473.
substitutes for milk goats, 275.
supplements for chicks, Minn., 472.
supplements for fattening cattle, 570.
supplements for pigs, Minn., 469.
Protein-rich diets, effects, 863.
Proteins—
animal and vegetable, effect on egg production, Mo., 71.
animal, for laying hens, Ind., 172; Iowa, 778.
decomposition, 310.
for laying hens, N.Mex., 173.
gluten, of wheat flour, 409.
in North Dakota wheat, N.Dak., 838.
molecular weights, 711.
sources for egg production, Can., 875.
urea substitution for, 672.
utilization in milk production, 274.
vegetable, studies, 364.
Protocalliphora avium, notes, 552.
Protoparce sexta, mosaic transmission by, Iowa, 748.
Protoplasm—
colloid chemistry of, treatise, 309.
reaction to salts, 124.
Protozoa—
in plants affected with mosaic, 646.
in soils of Egypt, effect of summer fallow, 518.
in soils of South Africa, 618.
in soils of United States, 19.
of man, catalogue, 855.
Prune brown rot outbreak in Oregon, 151.
Pruning, treatise, 641.
(*See also specific crops.*)
Prunus mume as stock for apricots, Calif., 449.
Pseudaonidia duplex, summary, 51, 653.
Pseudaphycus utilis, notes, 658.
Pseudococcus—
bromeliae, enemies of, 653.
comstocki, biology and control, Va., 757.
maritimus, mosaic transmission by, Iowa, 748.
nipae. (*See* Coconut mealybug.)
Pseudococcus—Continued.
tirolensis, notes, 652.
variabilis, description, 653.
Pseudomonas—
celebensis, provisional name, 250.
musae, notes, 250.
pisi, notes, 43.
pruni, notes, Colo., 146.
Psilocybe atomatoides as fermenting agent, 522.
Psoroptes cuniculi, notes, 82, 587.
Psylla mali. (*See* Apple psylla.)
Pterogon proserpina, parasite of, 55.
Pteromalus—
sp., notes, 259.
variabilis, oviposition and feeding, 560.
Ptinus fur, outbreak, 652.
Ptychomyia remota n.sp., description, 257.
Public health relation to milk, 178.
Puccinia—
graminis avenae, biologic specialization, 847.
graminis secalis, biologic specialization, 848.
maydis, life cycle, 246.
mirabilissima, new British record, 542.
n.sp., life cycle, 246.
podophylli, composite life history, 347.
pruni-spinosae, notes, 48.
spp., aecial stages, 749.
spp., notes, Ga., 246.
triticina, strains, 646.
Pullets—
as breeders, 273.
cost of rearing, Can., 875.
selection for egg production, Iowa, 778.
(*See also* Chickens *and* Poultry.)
Pulmonary congestion in calves, acute, 279.
Pumping, irrigation, experiments in Kansas, 282.
Pumpkin, canned, composition, 457.
Purdue University, notes, 97, 697.
Purnell Act and cooperation in research, 1.
Purple leaf moth of coconuts in Fiji, 859.
Putting greens, requirements, 139.
Pyralis farinalis as alfalfa hay pest, 361.
Pyrausta—
nubilalis. (*See* Corn borer, European.)
spp., notes, 559.
Pythium and Phytophthora merging into one genus, 645.
Pythium—
aphanidermatum, notes, 851.
artotrogus, notes, 854.
debaryanum and related species, studies, 855.
debaryanum, notes, 351; N.C., 746.
Quack grass eradication, Mich., 740.
Quail, life history investigations, 252.
Quaylea whittieri, notes, 260.
Quinces, spray schedules for, N.J., 37.
Rabbit snuffles, organisms associated with, 784.

Rabbits—
and hares, crossing experiments, 630.
chromosome numbers in, 523.
destruction in New South Wales, 153.
inheritance of characters, 522.
life history studies, Ariz., 754.
production of hidden hereditary factors in, 526.
sex control in, possibility, 731.
use in abortion studies, 885.
Rabies—
control, 178.
control in Connecticut, 80.
in dogs in Japan, Umeno's inoculation method, 583.
in dogs, vaccination against, 583.
methods of treatment, 79.
Radiation, solar, and the atmosphere, 316.
Radiator finishes, effect on heat transmission, 389.
Radioactive fertilizer, tests, 517.
Radishes, vitamins A and B in, 62.
Rainfall—
and climatic cycles, 825.
curves for cotton in Rhodesia, 317.
effect on wheat yield, 14.
effective, studies, U.S.D.A., 210.
Hawaiian, characteristics, U.S.D.A., 211.
in California, seasonal variability, U.S.D.A., 719.
of east coast of Sumatra, 510.
of 1924 in British Isles, 418.
of Tropics, unfavorable condition, 818.
relation to lake level, 316.
(*See also* Precipitation.)
Rain-tree mealybug, notes, 55.
Rams, purebred, improvement of flock with, Can., 869; Nev., 467.
Ramularia areola, notes, 148, 351.
Range—
flocks, value of purebred rams for, Nev., 467.
plants, poisonous. (*See* Plants, poisonous.)
studies, aid in livestock production, 268.
Ranges, national forest, cost and methods *of carrying cattle, 168.*
Rape—
pasture, feeding corn with, Ohio, 575.
poisoning in cattle, 279.
seed cake, feeding value, 579.
Raphanus sativus and *Brassica oleracea*, interspecific hybrids, 730.
Raspberries—
black, winter pruning, Mich., 848.
breeding experiments, Tex., 643.
culture, 848; Mo., 241.
Queensland, tropical species, 848.
variety tests, Ga., 239.
winter protection, U.S.D.A., 141.
Raspberry—
crown gall, notes, 547.
leaf and bud mite, 561.
spur blight, studies, 550.
Rations, induction of calcifying properties by irradiation, 865.
Rats—
albino and Norway, treatise, 274.
albino, body weight and length, correlations, 81.
albino, seasonal differences in sex ratio, litter size, and weight, 180.
anatomy, laboratory manual, 251.
breeding, and sex ratio, 832.
castration, effect on activity, 733.
female, factors affecting activity, 429.
growth and reproduction, effect of minerals in ration, 167.
growth of reproductive systems following thyro-parathyroidectomy, 572.
growth, sex differences in food requirements, 659.
in Hawaii, control, 551.
male, fertility as affected by X-rays, 430.
oestrous cycle, effect of mammary gland substance, 526.
(*See also* Rodents.)
Reclamation—
papers on, 399.
Project, Belle Fourche, work of, U.S.D.A., 398.
project in Elko Co., survey, Nev., 488.
Project, Newlands, work of, U.S.D.A., 899.
Project, Umatilla, work of, U.S.D.A., 398.
Service of Canada, report, 280, 789.
Red—
mite, European, effect of insecticides on eggs, Conn.State, 450.
spider, control in greenhouse, 452.
spider on hops, 554.
stripe weevil of coconuts, studies, 259.
wax scale, citrus pest in Japan, 158.
Redwater, Rhodesian. (*See* African coast fever.)
Redwood—
seeds, sterilizing, 243.
stem analysis, 828.
Redwoods as climatic measure, 614, 615.
Refrigeration, mechanical, treatise, 188.
Refrigerators, small, operation and efficiency, Ind., 792.
Remedies, new and nonofficial, 278.
Remigia repanda, notes, 156.
Reproduction—
dietary requirements for, 62, 565.
specific vitamin for, 866.
Reproductive organs of cow following parturition, changes in, Minn., 385.
Research—
agricultural. (*See* Agricultural research.)
in flour milling industry, field for, 614.
organic, introduction to, treatise, 809.
publication of, U.S.D.A., 483.
work of Department of Agriculture, 598.
Resins. (*See* Oleoresin.)

Respiration—
apparatus for plant and soil studies, 815.
of leaves, carbohydrate-amino acid relation in, 821.
Respiratory system of plants, 520.
Reversible variations in trees, 624, 625.
Reymann Memorial Farms, activities, W.Va., 174.
Rhagoletis—
cingulata. (*See* Cherry fruit fly.)
pomonella. (*See* Apple maggot.)
Rhizoctonia—
blight of beans, studies, 350.
development of alfalfa, 44.
disease of flax, notes, 851.
Rhizoctonia—
lamellifera, notes, 147, 148.
sp., notes, 248.
tuliparum n.comb., notes, N.Y.Cornell, 355.
Rhizoecus kondonis n.sp., notes, 158.
Rhizopus—
artocarpi, studies, 542.
nigricans and *R. artocarpi*, relation, 542.
sp., notes, 850.
Rhizopus decay of sweet potatoes, temperature relations, 752.
Rhode Island Station, notes, 198, 499.
Rhodes grass, characteristics and history, 137.
Rhododendrons—
insects affecting, 254.
self-sterility in, 41.
Rhubarb, fertilizer tests, 398.
Rhynchophorus schach, studies, 259.
Rice—
anomalous races in, 831.
blast, notes, 246.
borers, control, 857.
bran as supplement to camote vines for pigs, 575.
chromosomes in, differences, 831.
culture and preparation, treatise, 636.
culture experiments, La., 528.
fertilizer experiments, Guam, 430.
field, effect of soy bean cake on, 117.
fusariose, studies, 151.
growth as affected by decomposition of Astragalus, 215.
Helminthosporium disease, 853.
insects affecting in China, 857.
irrigation by pumping, 587.
plants, prevention of injury from Astragalus, 215.
root aphis, life history and control, 359.
seasonal variation in, 137.
weeds, control, 133.
Rickets—
in chicks, 671.
prevention, ultraviolet light *v.* irradiated air, 877.
treatments, comparison, 767.
Rickettsia—
pediculi, notes, 553.
prowazeki, notes, 552.
Rickettsia, use of term, 552.
Rinderpest in Western Australia, 181.
River stages, daily, at gage stations, U.S.D.A., 83, 788.
Road transport, economics of, 589.
Roads—
concrete. (*See* Concrete roads.)
construction and maintenance, treatise, 186.
construction, treatise, 388.
earth, grading, 589.
English, treatise, 186.
gravel, tar surface treatment, U.S.D.A., 284.
subgrades, removal of capillary moisture in, 83.
Rock—
blasting method, Wis., 483.
phosphate. (*See* Phosphate.)
Rocks, iodine content, 202.
Rocky Mountain spotted fever—
cause, 552.
infection of ticks with, 58.
organism, identification, 760.
Rodent pests, notes, 154.
Rodents—
bacterial disease, 651.
range, studies, Ariz., 754.
(*See also* Mice *and* Rats.)
Roentgen rays—
and temperature, effect on linkage and fertility, 428.
effect on fertility of rats, 430.
effect on germination of *Oryza sativa*, 519.
Roofing, prepared, durability studies, Iowa, 788.
Roofs, insulation, 287, 486.
Root—
crops, experiments, Can., 135.
crops, miscellaneous, 398.
growth, upper critical concentration of oxygen in, 421.
nodules. (*See* Nodule bacteria.)
tips, excised, growth under sterile conditions, 123.
Roots—
aeration, response of plants to, 222.
elongation, effect of carbon dioxide accumulation, 222.
value for milk production, Can., 674.
Rosales, relationships, 424.
Rose leaf tyer, notes, 155, 859.
Roselle diseases, 148.
Roses—
annual treatise, 41, 539.
Bulgarian oil-yielding, improvement, 844.
rambler, die-back disease of, 153.
treatise, 845.
Rotation of crops, Calif., 430; Can., 530; Minn., 130, 131; Ohio, 529; Wyo., 133.
Rotation of crops at North Dakota Station, U.S.D.A., 839.

Roughage from acid soil, effect on reproduction, Wis., 478.
Roundworm in rabbits, new species, 552.
Roundworms in animals, Wis., 479.
Royal Agricultural Society, report, 253.
Rubber—
brown bast, notes, 147.
diseases and pests, 158.
diseases, notes, 148.
latex, properties and use, 812.
losses due to excessive rains, 414.
planting methods, Guam, 430.
tapping, notes, 845.
Rubus spp., breeding experiments, 141.
Ruminants—
in Philippines, *metazoan parasites of*, 855.
parasites in, 760.
Rural—
banks in Germany, 592.
credit. (*See* Agricultural credit.)
depopulation in France, 897.
economics department at Ohio Station, Ohio, 899.
education, courses pertaining to, 495.
education, Government publications on, 397.
England, rebuilding, treatise, 693.
guide, Kelsey's, 798.
highways, beautification, Mich., 243.
industries in Scotland, 393.
labor. (*See* Agricultural labor.)
life, bibliography, U.S.D.A., 297.
life psychology, research problems in, 898.
life, studies, Mo., 493.
Pennsylvania, treatise, 595.
population, high school education of, 495.
population movements in Missouri, Mo., 493.
primary groups, Mo., 494.
problems in United States, 390.
school nurse, helps for, 95.
schools. (*See* Schools, rural.)
service study, progress in, 85.
social problems, laboratory work in, 193.
social psychology, treatise, 692.
standards of living in the South, 596.
(*See also* Community *and* Country.)
Rush weevil, notes, 363.
Russian knapweed in California, 238.
Rusts in South Africa, 245.
(*See also specific host plants.*)
Rutabagas. (*See* Swedes.)
Rutaceae, susceptibility to citrus scab, 855.
Rutgers University, notes, 98, 900.
Rye—
bran, feeding value, 666.
breeding experiments, 230.
chromosome numbers, 426.
culture, 339.
feeding value for pigs, Minn., 469.
grass, perennial, behavior in Denmark and Sweden, 236.
Rye—Continued.
grass, western, seeding experiments, Can., 530.
grass, western, variety tests, Can., 530.
green, effect on flavor and odor of milk, U.S.D.A., 879.
immunity to wheat take-all, N.C., 747.
improvement, N.C., 735, 835.
kernel, amino acids and polypeptides in, 712.
optimum soil reaction for, 320.
rust, tests, Ga., 246.
seeding experiments, Can., 530; Minn., 130.
solar energy used by, 508.
sterility in, 426.
varieties of Sweden, 835.
variety tests, Ariz., 733; Can., 530; Ga., 230; Ind., 431; Minn., 130, 131; N.C., 734; N.Dak., 334; U.S.D.A., 134; W.Va., 31.
wild mountain, new variety, 34.
Saissetia oleae. (*See* Black scale.)
Sal, volume tables for, 541, 644.
Salicylic aldehyde, decomposition by soil organisms, 214.
Saliva, diastatic activity, factors affecting, 761.
Salivary digestion of starch, effect of halogen salts, 761.
Salmonella pullora infection in fowls, 279.
Salmonellosis of swine, studies, 680.
Salt—
concentration, effect on assimilation of algae, 828.
consumption of ewes, Iowa, 773.
use on soils, 622.
Salts—
in soil and moisture, relation, 419.
soluble, movement in soils, 820.
vertical distribution in soils, 723.
San Jose scale—
control, 454; Ind., 154; Mo., 451; N.C., 755; N.Mex., 155; Ohio, 96, 556.
effect of sulfur, 452.
Sand—
and soil temperatures in Egypt, comparison, 115.
cherry plum hybrids, notes, U.S.D.A., 141.
dunes, reclamation in Palestine, 846.
shale in, determination, U.S.D.A., 683.
strength ratios, effect of grading, U.S.D.A., 483.
Sandbur, notes, U.S.D.A., 334.
Sandflies, breeding method, 860.
Sanitation and house drainage, treatise, 188.
Sap extraction from living leaves, 223.
Sap movements in trees, 624.
Saponarin, formation, 726.
Sarcophaga flavipes, parasite of Carolina mantis, 157.
Sauerkraut fermentation, effect of inoculation, 716.

Sawdust—
effect on crop growth, 121.
irradiated, effect on growth of rats, 264.
Sawfly—
new, injurious to jack pine, 861.
western wheat-stem, notes, N.Dak., 652, 857.
Scale insects—
classification, 359.
in Palestine, 157.
in Rhine Valley, 652.
of trees and shrubs in Colorado, 658.
Schedius kuvanae, parasite of gipsy moth, 561.
Schizoneura lanigera. (*See* Apple aphid, woolly.)
Schizophyllum commune, growth reaction toward acidity, 224.
School consolidations, data on, 396.
Schools, rural—
high, legal provisions for, 495.
high, organizations and curriculum, 194.
improvement by standardization, 396.
preparation of teachers, 396.
supervision, effects, 396.
Science—
general, treatise, 693.
of everyday life, treatise, 693.
Sclerospora, production of conidia at night, 542.
Sclerotinia—
americana, new name, Md., 448.
sp., notes, 43.
Sclerotinias, fruit-rotting, studies, Md., 448.
Sclerotium—
rolfsii, growth studies, Ga., 246.
rolfsii, notes, 148.
tuliparum, notes, N.Y.Cornell, 355.
Scolytus rugulosus. (*See* Shot hole borer.)
Scorpions—
combating in central Brazil, 357.
venom of, effect, 157.
Scours in young calves, 182.
Scrapie, studies, 279.
Scurvy, experimental, metabolism in, 164.
Scutellum rot on corn, Ill., 851.
Scutigerella immaculata—
biology and control, 58.
control, Calif., 450.
Sea kale root cuttings, regeneration of roots and shoots, 324.
Sea water, elimination of iodine from, 201.
Sedatives in treatment of botulism, 368.
Sedimentation—
studies, 824.
theory of, 16.
Seed—
control station in Budapest, report, 340.
disinfectants, tests, 646.
inspection in Maine, Me., 535.
inspection in North Carolina, 238.
testing in Russia, 585.
tests, N.J., 238.
Seed—Continued.
treatment for disease control, 43.
treatment for pepper diseases, 852.
Seed-borne infections, control, N.C., 747.
Seedcorn maggot—
notes, Iowa, 755.
transmission of potato blackleg by, 545.
Seeds—
Act of Canada, 238.
analyses, 130; Iowa, 436.
effect on pH equilibrium in solution, 828.
forest, fumigating and sterilizing, 243.
germinability, prolonging, 520.
germination—
effect of different forms of energy, 828.
energy yield in, relation to composition, 827.
minimum temperature, 223.
physiological characters in, 24.
imports, U.S.D.A., 728.
moisture determination in, 638.
neglected, in warehouses, weevil development in, 159.
oleaginous, state of oil in, 725.
weed. (*See* Weed seeds.)
weight relation to plant growth, N.J., 23.
Segregation in plants, 330.
Self feeders for pigs, Can., 870; U.S.D.A., 870.
Septic tank, description, 591.
Septic tanks, household, tests, 792.
Septicemia, hemorrhagic—
immunization, 382.
organisms, correlations between, 679.
Septoria—
antirrhini, notes, 550.
glycines, life cycle, N.C., 746.
petroselini apii, notes, 147.
Sequoias as climatic measure, 614, 615.
Sericulture. (*See* Silkworm.)
Serum—
adsorption of indicator in pH determination, 610.
calcium determination in, 505.
diagnostic studies of Rosales, 424.
Sesamum indicum varieties in Turkestan, 36.
Setaria—
digitata n.sp., notes, 760.
italica, inheritance in, 831.
Sewage—
analysis and interpretations, 288.
disposal, home, treatise, 188.
disposal system for farms, 487.
filter, protozoan fauna, 288.
irrigated areas, studies, 683.
sludge, aerobic decomposition, 87.
Sewer pipe design, Kutter's n determinations, 890.
Sewing materials, treatise, 496.
Sex—
characteristics, secondary, and interstitial glands, 525.

Sex—Continued.
characters, secondary, in fowls, determination, 130, 632.
chromosomes and sex determination, 731.
control in rabbits, possibility, 731.
determination and differentiation, 524.
determination, review, 731.
differentiation in bees, 655.
glands and metabolism, 665.
in the strawberry, 536.
ratio in mice, 732.
reversal following ovariotomy in fowls, 832.
reversal in birds, 30.
Sexes, differential death rate among animals, 525.
Sheep—
blowfly in domesticated animals, 159.
breeding, scrub v. purebred ram for, Okla., 68.
care and management, Okla., 467.
color inheritance in, 228.
costs and profits on irrigated farms, Oreg., 894.
earless and short-eared, inheritance in, 729.
feeding experiments, Can., 868, 869; U.S.D.A., 370.
(*See also* Ewes *and* Lambs.)
fertility in, 667.
gastro-intestinal parasites, control, Ohio, 584.
industry in Canada, 868.
inheritance in, Okla., 427; Wyo., 630.
inoculation with bovine Anaplasma, 182.
internal parasites of, 183.
management in southwest Virginia, Va., 68.
production, 68.
production in South Carolina, 272.
production, survey, N.Dak., 272.
projects in corn belt, 571.
ratio of births and slaughter, 167.
rations for, Okla., 66.
stomach worms in, 278, 584; Minn., 477; Ohio, 584.
stomach worms, summary, Conn.Storrs, 785.
testes, experiments on, 428.
toxic action of *Stachys arvensis* on, 888.
Wallachian, milk productiveness, 881.
(*See also* Ewes *and* Lambs.)
Shot hole borers of Hevea, 259.
Shredded wheat biscuits, irradiated, effect, 568.
Shrubs—
and trees of Panama Canal Zone, handbook, 540.
and trees, ornamental, treatise, 41.
hardy in British Isles, 243.
identification, handbook, 243.
ornamental, propagation, Wis., 498.
pruning, N.J., 345.
Silage—
careless weed, notes, Ariz., 433.
corn and soy bean, feeding value, Iowa, 779.
corn, loss of juice from, Ohio, 572.
corn v. sunflower, feeding value, Can., 674, 867.
corn, value for milk production, Can., 674.
crops, comparison, Can., 530.
crops, seeding experiments, Can., 530.
cutters, tests, Wis., 483, 486.
darso, digestibility, Okla., 168.
effect on pregnant ewes, Can., 869.
from legumes with corn and cane, Ark., 465.
moldy, effect on cattle, Minn., 465.
oat, pea, and vetch, feeding value, Can., 879.
oat v. sunflower, for fattening steers, 67.
plants, electrical, construction and operation, 168.
production and feeding, Mo., 66.
production, changes in, Wis., 65.
sorgo, tests, Nebr., 434.
summer, as pasture supplement, Iowa, 779.
sunflower, feeding value, Ariz., 769; Can., 878, 879; Mont., 772.
value for milk production, Can., 674.
Silani, new cover and forage crop, 137.
Silica, buffering effect on magnesia induced toxicity, 517.
Silk—
industry of south China, 558.
raw, international trade in, 295.
Silkworm diseases, notes, 558.
Silkworms—
grasserie affecting, 255.
inheritance of egg color in, 522.
Silo walls, making impervious, Iowa, 788.
Silos—
capacity studies, Iowa, 788.
electrical and German, comparison, 377.
filling costs, Wis., 487.
homemade crib, construction, 188.
trench, planning and construction, 188.
Silviculture, treatise, 644.
Simulium columbaczense in Rumania, 257.
Sires, breeding value, measuring, Ill., 675.
Sires, purebred, value for sheep breeding, Okla., 68.
(*See also* Bulls.)
Sirups, pectin and pentosan content, 207.
Sisal—
and henequen, reciprocal crossings, 332.
international trade, 296.
Sitophilus granaria. (*See* Granary weevil.)
Sitotroga cerealella. (*See* Angoumois grain moth.)
Skim milk—
feeding value, Ariz., 774; Wis., 470.
v. grain for calves, Wyo., 674.
v. milk powder for pigs, Can., 872.

Skin diseases, report, 78.
Slag. (*See* Phosphatic slag.)
Slope exposure, studies, 824.
Sludge, activated, use as fertilizer, Wis., 416.
(*See also* Sewage.)
Slugs, control, 252.
Smut treatment tests, Minn., 149.
(*See also specific hosts.*)
Snails—
as garden pests, 552.
attacking young sycamores, 252.
Snakeroot, white, poisoning, Ill., 78.
Snakes—
as host of chigger mite, 656.
relation to agriculture, Iowa, 755.
Snow—
holding, effect of cover crops, U.S.D.A., 141.
v. water for poultry, Can., 876.
Soap, selection and economic use in the home, Mo., 496.
Soaps, pure, germicidal properties, 609.
Social insects, 156.
Sodium—
arsenite for barberry eradication, 748.
arsenite, uses for weed killing, U.S.D.A., 327.
chloride action on plants and soils, 21.
chloride for barberry eradication, 748.
(*See also* Salt.)
determination in blood serum, 12.
fertilization to sugar beets, 516.
fluoride as bait for cutworms, 256.
fluoride, effect on rats, Iowa, 768.
fluosilicate, insecticidal value, 253, 357, 556.
hypochlorite, use against *Bacillus larvae*, 259.
in blood serum, determination, 206.
iodide treatment of Rochester's water supply, 463.
nitrate—
fertilizing value, Ind., 139; Iowa, 742.
injury to strawberries, N.H., 437.
nitrogen availability under varying conditions, 619.
toxicity to wheat sprouts, 21.
titanate, effect on plant production, 22.
Soil—
acidity—
and adsorption, Mich., 798.
and moisture, effect on potato scab, 546.
determination methods, 610.
of a rice field, effect of soy bean cake, 117.
studies, N.C., 818.
(*See also* Lime, Limestone, Liming, *and* Soils, acid.)
aggregates, disintegration, methods, 117.
analysis—
elements in, 416.
mechanical, 212.
Soil—Continued.
analysis—continued.
mechanical, colloidal determination in, 816.
mechanical, curves for, 815.
studies, 722.
and plant air, volume and composition, 823.
bacteria—
determination of number, 117.
development, effect of nutritive elements, 321.
effect of alkali salts, 512.
factors affecting activity, Mo., 415.
relation to fungi, 321.
blowing, effect of cover crops, U.S.D.A., 141.
colloids—
and tillage, 589.
climatic agencies in relation to, 719.
estimating, 319.
heat of wetting, factors affecting, 817.
studies, 510.
erosion, studies, 117.
fertility—
experiments, Minn., 119; Okla., 119.
maintenance, 142; Ohio, 217.
maintenance, effect of drying, 18.
permanent, Ill., 723.
studies, Ind., 419; Okla., 420; Wash.Col., 216.
heterogeneity in experimental fields, 134.
management experiments, Minn., 119.
microbiology, 215.
moisture—
and acidity, effect on potato scab, 546.
and salts, mutual effects, 419.
determination, effect of soil salt movement, 116.
effect of mulch, 719.
effect on tobacco, U.S.D.A., 339.
effect on wheat composition, 748.
equivalent, 318.
relations, physical theory, 817.
requirements of healthy and infected beans, 543.
mulch, effect on moisture absorption, 719.
nutrients, estimation by seedlings, 319.
reaction and crop growth, 320.
reaction and lime requirement, 510.
respiration apparatus, description, 815.
stresses, method of study, 683.
surfaces and polished metal, friction between, 588.
survey and land cover studies, 814.
survey in—
Arkansas, Lonoke Co., U.S.D.A., 616.
California, Eureka area, U.S.D.A., 16.

Soil—Continued.
survey in—continued.
Illinois, Mercer Co., Ill., 720.
Iowa, Benton Co., U.S.D.A., 416.
Iowa, Delaware Co., U.S.D.A., 616.
Iowa, Des Moines Co., U.S.D.A., 416.
Iowa, Dickinson Co., Iowa, 511.
Iowa, Dubuque Co., Iowa, 511.
Iowa, Emmet Co., Iowa, 511.
Iowa, Grundy Co., U.S.D.A., 212.
Iowa, Jasper Co., U.S.D.A., 416.
Maryland, Allegany Co., U.S.D.A., 417.
Maryland, Wicomico Co., U.S.D.A., 417.
Montana, Daniels Co., Mont., 720.
Nebraska, Boone Co., U.S.D.A., 212.
North Dakota, McHenry Co., U.S.D.A., 417.
Nyasaland, 115.
Pennsylvania, Greene Co., U.S.D.A., 616.
Tennessee, Henry Co., U.S.D.A., 814.
West Virginia, Tucker Co., U.S.D.A., 814.
suspensions, preparation, 117.
temperature—
and sand temperature in Egypt, comparison, 115.
effect of altitude and slope exposure, 19.
effect of irrigation, 318.
effect on wheat composition, 748.
thermometers, description, 815.
toxicity, methods of diagnosing, 224.
toxicity, studies, 224.
water conservation, 17.
(*See also* Soil moisture.)
Soils—
acid, biological activities in, Oreg., 418.
acid, lime requirement, Ohio, 516.
(*See also* Soil acidity.)
action of chlorides on, 21.
adsorption of dyes by, 617.
adsorptive capacity, estimation, 617.
alkali. (*See* Alkali.)
ammonia absorption by, 19.
ammonia determination in, 11.
ammoniacal nitrogen determination in, 10.
ammonification. (*See* Ammonification.)
black cotton, nitrogen changes in, 618.
black turf, in Transvaal, origin, 510.
Brazilian coffee, humus in, 418.
calcareous, available phosphate, 720.
capillary rise in, 419.
cultivated, nitrogen activity, 511.
drying, chemical changes in, 19.
effect of air drying, 419.
fertilizer requirements, determination, 420.
flocculation studies, Mo., 414.
forest and meadow, physical properties, 118.
Soils—Continued.
greenhouse, fertilizers for, Ohio, 514.
H-ion determination, errors in, 408.
impermeable, studies, N.Mex., 114.
lime requirement, determination, 510, 621.
lime requirement, standard soils for estimating, 120.
loss of nitrates from, 321.
Mediterranean red, origin, 115.
mineral, humification, measuring, 503.
moor. (*See* Peat *and* Moor.)
movement of soluble salts in, 820.
muck. (*See* Muck soils.)
nitrogen content. (*See* Ammonification, Nitrification, *and* Nitrogen.)
of abandoned plantations in India, 16.
of Bernardsville area, analyses, N.J., 16.
of Burma, buffer action, 510.
of California, cultivation studies, Calif., 419.
of Chatsworth area, analyses, N.J., 416.
of Denmark, lime requirements, 510.
of diabase origin, 616.
of Georgia, Burke Co., analyses, 212.
of India, ammonia fixation in, 617.
of Iowa, effect of gypsum, 622.
of Northern Great Plains Field Station, U.S.D.A., 114.
of Pusa, studies, 720, 721.
of Scotland, field study, 213.
of South Africa, protozoa in, 618.
of South Australia, correction of, 723.
of Texas, bacterial flora, 215.
of the Sudan, composition, 814.
of the Sudan, studies, 722.
of the Ukraine, survey, 213.
of Transvaal, reaction, 616.
of United States, protozoa of, 19.
of Washington, fertility, Wash.Col., 216.
organic matter in. (*See* Organic matter.)
peat. (*See* Peat.)
physical properties, effect of colloids, 816.
podsol, effect of excessive liming, 621.
red, characterization and classification, 115.
response to liming, calcium as indicator, 819.
Scottish mineralogical examination, 720.
setting free of iodine from, 202.
studies, Mo., 414; Wis., 415.
subgrade, procedure for testing, U.S.D.A., 284.
sulfur determination in, 11.
water-holding capacity, Wis., 415.
water-supplying power, estimating, 116.
Solanum elaeagnifolium berries, chymase in, 324.

Solar—
constant, measurements, 615.
energy, possible use of, 15.
radiation. (*See* Radiation.)
variation and weather forecasting, 812.
Sorghum—
composition, Nebr., 433.
effect of season of maturity, Guam, 430.
fertilizer experiments, Ariz., 733.
grain, club work, 695.
grain, cultural methods, Okla., 81.
grain, culture, Ariz., 433.
grain, nutritional value, Okla., 66.
grain, varieties, Calif., 430; Mo., 431.
hydrocyanic ocid in, 571.
seeding experiments, Nebr., 433.
smuts, varietal resistance to, U.S.D.A., 751.
v. corn as forage crop, Nebr., 433.
varieties for Kansas, 528.
varieties, forage value, U.S.D.A., 132.
variety tests, Ariz., 733; Guam, 430.
(*See also specific kinds.*)
Sorgo—
culture, Ariz., 433; Nebr., 433.
improvement, N.C., 735.
seed, ground, feeding value, Kans., 377.
seeding experiments, Nebr., 433.
silage. (*See* Silage.)
silage merits, U.S.D.A., 132.
varieties, Mo., 431; Okla., 133.
varieties for Kansas, 528.
varieties for silage, Nebr., 434; U.S.D.A., 334.
varieties, sugar content, Okla., 111.
variety tests, Ariz., 733; N.Dak., 334; U.S.D.A., 834; Wyo., 133.
Sorosporium reilianum, notes, U.S.D.A., 751.
Sorrel hybrid, mosaic of sexes in, 731.
South Carolina Station, notes, 499.
South Dakota Station, notes, 99.
Sow thistle, control, Minn., 131.
Soy bean—
anthracnose, notes, N.C., 746.
cake decomposition, factors affecting, 219.
cake, effect on acidity of a rice field, 117.
forage, feeding value, Iowa, 774.
hay for breeding ewes, 571.
meal, feeding value, Va., 578.
mildew, notes, N.C., 746.
oil, composition, 105.
oil meal, feeding value, Ind., 175; Ohio, 575.
oil meal, value for pullets, Ind., 779.
Soy beans—
and corn, hogging down, Minn., 170; Mo., 70.
as hay v. silage, Ohio, 579.
as legume crop, Wis., 435.
culture, Iowa, 636.
culture experiments, Ohio, 787.
feeding value, Ill., 68; Ind., 176; N.C., 775; Ohio, 575.
Soy beans—Continued.
for hay and seed, time of harvesting, 339.
growth relation to seed weight, N.J., 23.
hogging down, 870.
improvement, N.C., 735, 835.
in Connecticut, Conn.Storrs, 837.
nodulation, differences in, 328.
nodulation, effect of bacterial numbers, 327.
planting experiments, Ariz., 733.
seeding experiments, Md., 332; Minn., 130.
studies, Wis., 432.
sunburn and aphid injury, Ariz., 746.
v. alfalfa hay for dairy cows, Wis., 473.
v. cowpeas for seed and hay, Mo., 431.
varieties for Kansas, 528.
variety tests, 133; Ariz., 733; Can., 530; La., 528; Md., 332; Minn., 130, 131; N.C., 734; N.Dak., 334; Wis., 432; Wyo., 133.
whole v. ground, for pigs, Ind., 172.
Spacing experiments, method, 230.
Sparrows, Spanish, as grain pests in Sudan, 153.
Species, origin by large mutations, 126.
Spelt—
breeding experiments, 230.
variety tests, U.S.D.A., 134.
Speltoids and other aberrants in wheat, cytological studies, 426.
Spelt-rye hybrid, growth anomalies, 129.
Sphacelotheca spp., notes, U.S.D.A., 751.
Sphaeronema fimbriatum, notes, 148, 153, 854.
Sphaeropsis malorum, nitrogen metabolism of, 122.
Sphaerostilbe repens, notes, 153.
Sphaerulina leaf spot of clover, 849.
Spharagemon aequale, notes, 756.
Spices, treatise, 9.
Spider—
mite. (*See* Red spider mite.)
parasite, egg-laying - experience with, 154.
Spilosoma lubricipeda caterpillars, poisons for, 52.
Spinach—
blight resistant strains, 543.
canned, vitamin C in, 764.
chlorotic, manganous sulfate for, 819.
dehydrated, manufacture, handling and storage, 209.
fertilizer experiments, Va.Truck, 640.
iron content, 456.
proteins, studies, 364.
Spodoptera mauritia, notes, 558.
Spore germination, stimulation by carbon dioxide, 423.
Spragg, F. A., biographical sketch, Mich., 798.
Spray—
burn, notes, 253.
coating maintenance on apples, 856.

Spray—Continued.
- injury, 856.
- injury to apples, Mass., 446.
- schedule, revised, for western humid section, 148.
- schedules for fruits, N.J., 37; Mich., 37.

Spraying—
- and dusting experiments, 856.
- *and dusting machines*, 390.
- dust. (*See* Dusting.)
- experiments, Mo., 437; Ohio, 548.
- experiments in Illinois, 547.
- (*See also* Apples, Potatoes, *etc.*)

Sprays—
- arsenical, adhesives for, 452.
- copper. (*See* Copper.)
- dry-mix, tests, Va., 40.
- effect on rest period of fruit trees, 240.
- improving with a fixative, 856.
- physics of, papers on, 556.
- polysulfides in, 506.
- protective, spreading quality, 848.
- status of spreaders in, 253.
- (*See also* Insecticides, Fungicides, *and specific forms.*)

Spreaders, status in spray solutions, 253.

Spruce—
- Adirondack swamp, ratios of form in, 41.
- beetle, eastern, control in Canada, 557.
- *budworm defoliation, relation to previous growth of trees*, 559.
- budworm, studies, 458, 559.
- Engelmann, reproduction, 845.
- need of conserving, 145.
- new coccid on, 652.
- pulp digestion, sugar yields in, 810.
- red, tracheids, comparative lengths, 42.

Squash, fertilizer experiments, N.H., 438.

Squirrels—
- Columbian ground, breeding and development, 756.
- Columbian ground, tracking to burrow, 756.
- ground, aestivation and hibernation, 251.
- ground, of Colorado, 153.
- of diverse food habits, alimentary tracts, 551.

Stachys arvensis poisonous to sheep, 888.

Stalk borer, notes, Iowa, 755; N.H., 451.

Stallions, toxic effects of Bayer 205 in, 786.

Staphylococcus aureus, resistant to soap, 609.

Starch—
- gelatinization temperatures, 410.
- grains, development in potato tubers, 421.
- in plant cells, formation and digestion, 826.
- in plant tissue, determination, 106.
- in red algae, 519.
- salivary digestion, effect of halogen salts, 461.
- *solubility or insolubility*, 725.

Starling, European, in Ohio, Ohio, 51.

Starters, studies, Iowa, 781.

Steer carcass contest, analysis, 571.

Steers—
- dehorning, effect, Can., 868.
- feeding experiments, 67; Can., 868; Ind., 465; U.S.D.A., 466.
- feeding, in Alberta, 68.
- feeding in sugar-cane belt, U.S.D.A., 271.
- undernutrition in, 571.
- winter fattening, 574.
- yearling, fattening, N.Mex., 169.
- (*See also* Cattle.)

Steffen waste water, potash recovery from, 322.

Steiroxys trilineata, notes, 756.

Stemphylium sp., notes, 750.

Stephanoderes hampei, bionomic data, 759.

Sterigmatocystis nigra, conidia formation in, 519.

Sterilizer, electric, for average sized dairy, 590.

Stictocephala sp., notes, Ariz., 745.

Stigmata in poppy, variation and fluctuation in, 626.

Stock. (*See* Livestock.)

Stock foods. (*See* Feeding stuffs.)

Stockyards fever. (*See* Septicemia, hemorrhagic.)

Stomach worms and nodular diseases of *sheep, Ohio*, 584.

Stomach worms in sheep, 278, 584; Conn. Storrs, 785; Minn., 477.

Stomata—
- effect on transpiration, 223.
- movement, mechanism, 25.
- regulation, effect of drought, 423.

Storage—
- batteries, treatise, 187.
- cellar, bank, construction and management, Pa., 287.

Straw—
- breaking strength, apparatus for testing, 836.
- decomposition in soil, 418.
- v. hay for wintering heifers, Can., 879.

Strawberries—
- culture in England, 343.
- fertilizer experiments, La., 536.
- injurious effect of sodium nitrate, N.H., 437.
- profits from, Ky., 391.
- *sex in, importance*, 536.
- shipments and unloads, U.S.D.A., 291.
- systems of planting, Can., 840.
- variety tests, Miss., 239.

Strawberry—
- leaf scorch in North Carolina, 754.
- products, detection of spoilage in, 807.
- root louse in Tennessee, 556.

Streptococci, preserving, hormone blood agar for, 582.

Streptococcus lactis in curdling milk, relation to ripening of cheese, 581.

Streptogyne crinita as weed in Belgian Kongo, 839.

Struts, tapered, studies, 483.
Stumps, removal, devices for, 387.
Subgrade surveys, field methods, U.S.D.A., 683.
Subsoiling—
experiments, Ill., 17; U.S.D.A., 335.
studies, 214.
Subsoils—
availability of nutrients in, 319.
inactive, toxic properties, 320.
Suburban trend, treatise, 797.
Sudan grass—
analyses, 666.
chlorophyll deficiencies in, 27.
composition, Nebr., 433.
culture, Nebr., 433.
hay v. alfalfa for milk production, Kans., 779.
seeding experiments, Nebr., 433; Wyo., 133.
v. alfalfa pastures for pigs, Kans., 371.
Sugar beet—
curly leaf, studies, Calif., 449.
root aphid, notes, Utah, 254.
root diseases, causes and prevention, 248.
root maggot, notes, Utah, 254.
seed disinfection, 248.
(*See also* Beet.)
Sugar beets—
analyses, Can., 135.
breeding experiments, 230.
distribution of sugar and other substances in, 24.
effect of preceding crop, U.S.D.A., 335.
effect of rock salt, 516.
in Czechoslovakia, variety tests, 637.
insects affecting, Utah, 254.
optimum soil reaction for, 320.
production under irrigation, N.Dak., 529.
variety tests, Can., 530; Minn., 130.
washed and unwashed, preservation, 532.
Sugar cane—
bagasse, spontaneous combustion in, 522.
borer, studies, 155.
buds, germination, effect of cold, 838.
culture experiments, 133.
culture in Palestine, 84.
cuttings, hot water treatment, 852.
deterioration between cutting and milling, 34.
disease, 246.
diseases, control, 547.
diseases, serious nature of, 47.
effect of acid salts, 829.
entomology, 857.
fertilizer experiments, 137.
flower, anthesis of, 523.
insects control in Queensland, 857.
insects in Louisiana, 358.
juices, filtration, effect on microorganisms in, 612.
Sugar cane—Continued.
juices, pectin and pentosan content, 207.
Lahaina disease and soil acidity, 829.
leaf spot diseases, studies, 147, 250.
mosaic. (*See* Sugar cane mottling disease.)
moth borer, summary, 51.
mottling disease—
cause, 47.
control in Porto Rico, 852.
eradication campaign in South Africa, 47.
in Cuba, 249.
in Jamaica, 249.
in Porto Rico, 249.
studies, 47.
transmission by *Aphis maidis*, 649.
pink borer, notes, 361.
root parasite, notes, 47.
root rot, notes, 853.
seed, hot-water treatment, 22; U.S.D.A., 23.
seedlings, tests, La., 528.
sereh-diseased, microflora in, 853.
soils, water-supplying power, 116.
spacing experiments, 237.
Super-Cristalina, description, 236.
Super-Uba, description, 236.
tasseling, summary, 838.
Uba, deterioration, 838.
Uba, streak disease in, 47, 546.
varieties, 837.
varieties at Pusa, 531.
varieties, identification, Jeswiet method, 739.
vegetative organs, anatomy, 324.
water requirements, 17.
windrowing, 533.
yellow stripe. (*See* Sugar cane mottling disease.)
yield factors, 249.
Sugar—
factories, chemical control for, methods, 208.
factories, chemical control, normal juice factor, 508.
factories, clarification in, 207.
formation in sulfite digester, 810.
in blood. (*See* Blood sugar.)
in normal urine, nature, 68.
in plant tissue, determination, 108.
in sorgo varieties, Okla., 111.
in urine, determination, 505.
industry and by-products, 187.
industry in Egypt, 34.
manufacture, colloids in, 613.
manufacture, inversion losses in, 716.
manufacture, treatise, 411.
metabolism in plant cells, 626.
production in Java, relation to climate, 509.
raw, *deterioration in storage*, 613.
raw, removing gummy and waxy material, 315.
refineries, use of pH determinations, 612.

Sugar—Continued.
refining, indicators in, 507.
solutions, concentration, effect of filter materials, 110.
solutions, polarization, effect of salts, 811.
Sugars—
determination in leaves, 822.
effect on insulin intoxication, 462.
effect on respiration in leaves, 821.
(*See also* Dextrose, Glucose, *etc.*)
Sulfate of ammonia. (*See* Ammonium sulfate.)
Sulfates, retention by heavily limed soil, 320.
Sulfofication, effect on oxidation of organic matter, 820.
Sulfur—
action on ewes, Iowa, 768.
and nitrogen metabolism, relation, 762.
as fungicide, 148, 847.
as insecticide, 452.
determination in soils, 11.
dioxide, use in marketing grapes, Calif., 744.
effect on alkalinity, 723.
effect on Palouse silt loam, 516.
factor in acid phosphate, 724.
in grains, effect of irrigation water, 735.
mixtures. (*See* Lime-sulfur.)
relation to alfalfa production, 735.
sublimed, fertilizing value, 517.
Sulfur-naphthalene dust, preparation, 452.
Sumac disease, Iowa, 746.
Sun spots—
and temperature, 418.
relation to lake level, 316.
Sun—
ultraviolet rays of, 569.
variations of, relation to weather, 508.
Sunflower—
head, chimera in, 331.
silage. (*See* Silage.)
Sunflowers—
and sunflower seed, Can., 287.
as silage crop, Ill., 533.
culture, Ariz., 433.
cutting tests, Can., 530.
for silage, tests, U.S.D.A., 334.
seeding experiments, Can., 530.
silage merits, U.S.D.A., 132.
variety tests, Can., 530.
Sunlight—
as factor in pork production, 870.
effect on animal nutrition, 867.
effect on antirachitic value of milk, 177.
relation to leg weakness in chicks, 876; Ohio, 576.
relation to nutrition, Wis., 463.
(*See also* Light.)
Superphosphate and calcium cyanamide mixtures, chemical changes in, 713.
Superphosphates—
analysis, sources of error in, 804.
fertilizing value, 126.
(*See also* Phosphates, comparison.)
Superphosphates—Continued.
free phosphoric acid determination in, 804.
residual effects, 620.
sulfur factor in, 724.
Superpower and World Power Conference, 598.
Surra in donkeys, treatment, 183.
Swamp fever. (*See* Anemia, infectious equine.)
Swede root juice, antiscorbutic value after cold storage, 567.
Swedes—
optimum soil reaction for, 820.
variety tests, Can., 530; Minn., 130; N.Dak., 334.
Sweet clover—
Arctic, aberrant forms in, 129.
cutting tests, Can., 530.
hay, continuous feeding, results, Minn., 477.
hay, disease in cattle caused by, 571.
hay, feeding value, Minn., 169.
hay v. alfalfa, Iowa, 779.
pasture v. alfalfa, Minn., 171.
seed production, Can., 530.
seed, scarification, Minn., 131.
seeding experiments, Can., 530; Ind., 431; Okla., 133.
time for plowing under, Ohio, 599.
tolerance for alkali, 820.
varieties for Kansas, 528.
varieties, forage value, U.S.D.A., 132.
variety tests, Can., 530; Minn., 130; N.Dak., 334.
white, cytology, 328.
yellow v. white, N.Dak., 334.
Sweet corn—
breeding experiments, Ind., 139; Wis., 432.
endosperm, carbohydrate storage in, 421.
root rot, control, Conn.State, 442.
(*See also* Corn.)
Sweet pea disease, new, 49.
Sweet peas—
linkage in, 331.
mutations in, Can., 849.
wild, rust of, life cycle, 245.
Sweet potato—
bed decay, control, Ga., 246.
black rot fungus, ascigerous stage, 854.
mosaic disease, 649.
Rhizopus infection, relation to humidity, 854.
storage-rot fungi, 753.
weevil in Java, 652.
weevil, summary, 51.
Sweet potatoes—
breeding and heredity, 831.
culture experiments, Miss., 35.
culture in California, Calif., 534.
decay, effect of temperature, 752.
fertilizer experiments, 142, 898.
flowers and seed, 833.
pruning experiments, Ariz., 734.
selection, 828.

Sweet potatoes—Continued.
- *spacing experiments*, *Miss.*, *131*.
- statistics, U.S.D.A., 92.
- storage, Miss., 35; U.S.D.A., 339.
- variety tests, 133; Ga., 230; Guam, 430; Miss., 131; N.C., 835.

Swine—
- diseases, control, 78, 179.
- husbandry, treatise, 69.
- register of performance, 571.
- tuberculosis, 179.
- (*See also* Pigs.)

Syagrus rugifrons on cotton in Africa, 258.
Sycamore anthracnose, notes, 43.
Symbiosis—
- in animals and plants, 856.
- in Orchidaceae, 726.

Symptomatic anthrax. (*See* Blackleg.)
Synchytrium endobioticum, relation to host, 47.
Syngamus spp., notes, 553.
Tabanidae, Indian, papers on, 55.
Tachina larvarum, biology, 55.
Tachinidae, primary larvae, 159.
Tankage—
- and corn or barley, feeding value, Minn., 171.
- as supplement to alfalfa pasture, Kans., 371.
- v. alfalfa hay as protein supplement, U.S.D.A., 373.
- v. beef scrap for poultry, Can., 876.
- vitamin in, 571.

Tar—
- *from hard maple*, *718*.
- products, fungicidal action, 148.

Tariff information surveys, 240.
Tarnished plant-bug on peaches, Ind., 154.
Tartar emetic for surra treatment, 183.
Taxation of rented farms, U.S.D.A., 90.
Taxonomy, experimental, 824.
Tea—
- analyses, Conn.State, 657.
- diseases, 49, 148.

Teak, volume tables for, 644.
Telea polyphemus outbreak, notes, 856.
Telenomus sp., studies, 454.
Tempe drainage ditch, Ariz., 789.
Temperature—
- and light, interrelation in plant growth, 222.
- and sun spots, 413.
- coefficients and efficiency of photosynthesis, 821.
- curves for cotton in Rhodesia, 317.
- effect on nitrate production, 512.
- high, effect on germination of corn, 623.
- high environmental, effect on dogs, 658.
- minimum, for seed germination, 223.
- (*See also* Climate *and* Soil temperature.)

Tenebrioninae larvae, studies, 557.
Tennessee—
- economic and social study, 494.
- Station, notes, 699.

Tent caterpillars—
- destruction by children in Canada, 856.
- destruction by children in New York, 858.
- studies, 158.

"Teopod," new type of corn, 29.
Teozein, new amino acid, 802.
Tepary beans—
- as green manure crop, Ariz., 733.
- culture, Ariz., 433.

Terastia meticulosalis, notes, 654.
Termites—
- injury to orchards, 856.
- notes, Okla., 155.

Terracing of farm land, 387.
Testes—
- histological changes during scurvy *and inanition*, *526*.
- sheep, experiments on, 428.

Tetanops aldrichi, notes, Utah, 254.
Tetrachlorethylene, a new anthelmintic, 585.
Tetranychus—
- *altheae on hops*, *554*.
- *telarius*. (*See* Red spider.)

Tetraphosphate, fertilizing value, 120.
Tetraphyllidea, monograph, 761.
Tetrastichus—
- *blepyri*, notes, 260.
- *philodromi* n.sp., description, 561.
- *rapo*, studies, 656.

Texas—
- College, notes, 198, 500.
- root rot, control, 647.
- root rot fungus, life history, 544.
- root rot on cotton and locust trees, N.Mex., 147.
- Station, notes, 500.
- Station, report, 599.
- Technological College, opening, 500.

Textile—
- Conference, Empire, proceedings, 580.
- fibers, physical properties, 581.
- industries in India, 580.

Textiles—
- absorption and desorption of moisture by, 581.
- and clothing, Government publications, list, U.S.D.A., 299.
- cleaning and dyeing, treatise, 507.
- dictionary of, 412.
- testing, Rejto method, 694.
- textbook, 694.

Theileria—
- *mutans in Palestine*, 760.
- *ovis*, notes, 183, 482.

Thereva plebeia, economic importance, 257.
Thermometers, soil, description, 815.
Thielavia basicola, parasitism of ascospore strains, Conn.State, 441.
Thielaviopsis paradoxa—
- notes, 147.
- on coconut, 251.

Thistle, Canada, *eradication*, Ohio, 740.
Thlaspi arvense in grain seed, 96.
Thomas slag. (*See* Phosphatic slag.)
Threshing ring, management, Ill., 489.

Thrips affecting *Lilium* spp., 858.
Thrips tabaci. (*See* Onion thrips.)
Thymol blue, dissociation constants, determination, 714.
Thyroid—
and parathyroid removal, effects, 572.
size in pigeons, seasonal variation, 834.
Thyroids diminished in size, effect on calf, 369.
Thysanoptera of North America, additions and correction, 52.
Thysanus niger, notes, 260.
Tick—
commonest Indian, morphology and bionomics, 260.
eradication in Georgia, 80.
eradication, papers on, 78.
eradication work, 179.
fever, Rhodesian. (*See* African coast fever.)
Ticks—
infection with Rocky Mountain spotted fever, 58.
microorganisms transmitted hereditarily in, 783.
Tillage—
and weeds, 791.
experiments at North Dakota Station, U.S.D.A., 383.
physico-chemical factors affecting, 589.
Tilletia—
levis, control, 647.
tritici, cytological studies, 847.
tritici spores, effect of copper sulfate, 542.
Timber—
seasoning and preservation, treatise, 684.
volume tables, construction of taper curves for, 541.
(*See also* Wood.)
Timothy—
improvement, 729.
optimum soil reaction for, 320.
seed, hulled, germination, 237.
seed production, Can., 530.
seeding experiments, Can., 530.
smut spores, germination, 649.
variety tests, Can., 530.
Tires, low pressure, studies, 488.
Tischeria malifoliella. (*See* Apple leaf trumpet miner.)
Titanium, effect on plant production, 22.
Tobacco—
bacterial wilt, control, N.C., 847.
black fire, notes, Wis., 443.
bright, production, 238.
curing experiments, 835.
dust, notes, Calif., 477.
effect of soil moisture, U.S.D.A., 389.
export shipments, routing, 295.
fertilizer experiments, N.C., 835.
flue-curing, heating appliances, 892.
frenching, infection experiments, N.C., 746.
giant mutant in, 831.
Tobacco—Continued.
grades, chemical constituents in, Ky., 739.
histological studies, 133.
improvement, N.C., 735.
leaf, effect of distancing, 238.
mosaic, causal agent, cultivation, 457.
mosaic, protozoa associated with, 646.
mosaic, temperature studies, 646.
mosaic, transfer from potatoes, Wis., 443.
nematodes, notes, 148.
new hybrid varieties, 835.
powder and lime mixture, use against warble maggots, 584.
quality, chemical factors in, 637.
rack curing, 531.
root rot resistant varieties, Pa., 753.
rotation and harvesting tests, N.C., 835.
sand-drown, control, N.C., 854.
seed bed disease, control, 147.
seed germination, effect of age, Wis., 435.
varieties and hybrids, studies, Can., 340.
variety tests, Can., 530.
wildfire control in seed bed, 854.
wrapper, culture in Philippines, 835.
Tomato—
black stem-end rot, notes, Ind., 146.
cuttings, regeneration of roots and tops, 240.
greenhouse streak or winter blight, notes, Ind., 146.
leaf roll, transmission, Ind., 154.
mosaic, abnormalities produced in fruit by, 753.
mosaic, causal agent, cultivation, 547.
mosaic, transmission, Ind., 154.
products, gaseous fermentation, N.Y. State, 412.
seed selection, Mo., 446.
wilt, control, Mo., 442.
wilt resistant strains, 548.
wilt resistant varieties, Calif, 446.
Tomatoes—
Baltimore-Indiana, notes, Ind., 139.
breeding experiments, U.S.D.A., 141.
culture under glass, treatise, 842.
early set, effect of frost protectors, Mich., 341.
effect of carbon dioxide, 640.
effect of growing in same soil, 639.
fertilizer experiments, 639; Miss., 37, 342; N.H., 438.
green, ripened in warehouses, antiscorbutic value, Wis., 459.
processing, 209.
pruning, Can., 840; Ohio, 535.
seed selection, Mont., 742.
shipments and unloads, U.S.D.A., 293.
varieties at Newlands, U.S.D.A., 840.
variety tests, Ariz., 741; Miss., 37, 342.
vegetative growth, effect of fruit, 142.

Tortrix—
alleniana, notes, 155, 859.
fumiferana. (*See* Spruce budworm.)
pallorana, notes, 652.
viridana, parasites of, 760.
Tourist camps, Mich., 94.
Town and country, service relations, Wis., 487.
Townsend Valley, Montana, geology and ground water resources, 281.
Tracheo-laryngitis in poultry, 786.
Tractors—
catalogue, 891.
general-purpose, engineering progress in, 187.
on Ohio farms, Ohio, 688, 790.
operation costs, Mich., 392.
Trade area, rural, analysis, Mo., 494.
Traffic signals, colors and forms, U.S.D.A., 790.
Trama erigeronensis, life history, Ohio, 555.
Transpiration, control by stomata in leaves, 223.
Transpiring power and habitat differentiation of plants, 123.
Travassosius americanus from stomach of beaver, 553.
Tree—
die-back or twig blight, notes, 50.
growth and climatic cycles, 825.
growth and reversible variations, 625.
growth, dendrographic records, 822.
growth records, 517.
seeds, fumigating and sterilizing, 243.
Trees—
and shrubs of Panama Canal Zone, handbook, 540.
and shrubs, ornamental, treatise, 41.
at Mandan, N.Dak., tests and culture methods, U.S.D.A., 145.
Christmas, plantations, Mich., 345.
coniferous. (*See* Conifers.)
cultivated, mistletoes attacking, 148.
defoliation, results, 453.
distribution under Kinkaid Act, U.S.D.A., 846.
eccentric growth in, cause, 243.
endemic, of Monterey Peninsula, 823.
flowering, of India, treatise, 243.
girdling effect, Guam, 436.
hardy in British Isles, 243.
identification, handbook, 243.
injecting chemical substances into, Calif., 421.
of Arkansas, guide, 41.
of Belgian Kongo, 644.
of California, descriptions, U.S.D.A., 243.
planting at Belle Fourche, U.S.D.A., 345.
reversible variations in volume, pressure, and sap movements, 624.
shade, insects affecting in Canadian prairies, 857.
Trematodes—
Brazilian, catalogue, 357.
Brazilian, life history, 357.
Trembles. (*See* Milk fever.)
Trench fever, cause, 553.
Trichacis remulus, notes, 860.
Trichoderma koningi, decomposition of proteins by, 310.
Trichogramma—
evanescens, studies, 57.
minuta, notes, 555, 653.
Tricholyga sorbillaria, notes, 558.
Trichostrongylus affinis n.sp., description, 552.
Trimerotropis monticola, notes, 756.
Triodontophorus tenuicollis, life history, 280.
Trionymus polyporus, description, 653.
Trioxys, oviposition, 652.
Tristachya rehmani, rust on, 246.
Triticum and Aegilops, hybrids, 730.
Triticum—
monococcum aegilops and *T. monococcum cereale* in Taurida, 138.
vulgare ferrugineum, systematic botanical study, 138.
Trombicula irritans, studies, 656.
Truck—
crops, aphids affecting, 255.
crops, fertilizer experiments, 142.
crops, insects affecting, Ill., 555.
farms, agricultural labor on, U.S.D.A., 291.
Trucks. (*See* Motor trucks.)
Trypanosoma—
americanum and complement fixation tests, 679.
congolense-pecorum, in pigs, 888.
soudanense in camels, treatment, 583.
Trypanosomes, action of Bayer 205 on, 886.
Tryptophane—
chlorimetric determination, 715.
synthesis, 657.
Tsetse flies, guide to study, 257.
Tuart bud weevil, studies, 56.
Tuba root pink disease, 148.
Tubercle bacillus, avian type, in swine, Wis., 479.
Tuberculin—
and spread of tuberculosis, 383.
reaction and anaphylaxis, 382.
standardization, 382.
test—
cause of failures, 384.
effect on milk supply, 580.
intradermal, 679.
no-lesion and skin-lesion cases in, 383.
value with cattle, Minn., 477.
Tuberculosis—
and tuberculin test, 383.
avian, in a marsupial, 80.
avian, in cattle, Wyo., 680.
avian, transmission through eggs, 384.
avian, tuberculin test in, 786.
diagnostic value of tests, 80.
effect on poultry industry, Minn., 477.
eradication, papers on, 78.
experimental, in rats, 866.
immunizing children against, 80, 886.

Tuberculosis—Continued.
immunological studies, 583.
in cattle, papers on, 179, 270.
in guinea pigs, value of Dreyer antigen, 279.
in poultry, Mont., 279.
in range cattle, 179.
in swine, cause of increase, Nebr., 384.
of the skin, studies, 785.
present knowledge, 381.
Tuburcinia cepulae, control, 44.
Tudor economic documents, treatise, 93.
Tularemia, studies, 651.
Tulip—
blossom blight, description, Ill., 356.
gray bulb rot, control, N.Y.Cornell, 355.
Tumors, hereditary, in Drosophila, 28.
Turkeys—
care and management, 578, 672.
causes of loss in California, Calif., 787.
raising in Philippines, 72.
Turmeric paper, double-reacting, preparation, 805.
Turnip flavor in milk, cause, 880.
Turnips—
analyses, Can., 135.
feeding value, Can., 878.
optimum soil reaction for, 320.
seed production, Can., 530.
seeding experiments, Can., 530.
value for milk production, Can., 674.
Turpentine industry in Italy, 244.
Twins, single-ovum, in the pig, 525.
Tylenchus—
devastatrix, studies, 49.
dipsaci, notes, 155; Colo., 154.
dipsaci on alfalfa, N.Mex., 147.
Typhlocyba comes. (*See* Grape leafhopper.)
Typhoid epidemic in Chicago due to oysters, 267.
Typhus, cause, 552.
Typhus fever, mild, in lower Rio Grande Valley, 360.
Ultraviolet—
irradiation—
effect on blood calcium, 763.
effect on rickets, 763.
effects, 568, 767.
light—
and irradiated air, comparison for rickets prevention, 877.
effect on calcium and phosphorus equilibrium, 379.
effect on egg production, 274.
effect on growth of rats, 264.
effect on nuclear division of plants, 423.
effect on nutrition in poultry, Me., 375.
effect on properties of rations, 865.
reduction of carbon dioxide by, 26.
rays of the sun, 569.
Uncinaria spp., synonymy, 552.
Uncinula—
spiralis, notes, 152.
spp., notes, 43.
United States—
Department of Agriculture—
bibliographical aid to research, 101.
Bureau of Agricultural Economics. (*See* Bureau of Agricultural Economics.)
laws relating to, U.S.D.A., 299.
Weather Bureau. (*See* Weather Bureau.)
work of, papers on, 598.
Livestock Sanitary Association, proceedings, 78, 178.
Urea—
and ammonium sulfate, comparison, 119.
as protein substitutes for milk goats, 275.
fertilizing value, 322.
micro determination, 10.
substitution for protein, 672.
synthetic, fertilizing value, 724.
toxicity to wheat sprouts, 21.
Urease—
in legume nodules, 722.
variations in diastatic activity, 422.
Uredineae, biology, 43.
Uredo gossypii, notes, 351.
Uric acid—
determination, Benedict's method, 207.
in poultry excreta, determination, 503.
Urine—
normal, sugar in, 68.
sugar determination in, 505.
(*See also* Manure, liquid.)
Urocystis cepulae—
control, 44.
life history, Mass., 445.
Uromyces spp., biology, 43.
Ustilago—
spp., varietal resistance and susceptibility of oats to, U.S.D.A., 149.
striaeformis spores, germination, 649.
Utah—
College, notes, 699.
Station, notes, 699, 799.
Vaccaria parviflora in grain seed, 36.
Vacuome in pollen grains of gymnosperms, 520.
Vanilla—
extract, analyses, Conn.State, 657.
extracts, sources of, identification, 808.
Vanillin—
decomposing organisms, decomposition of organic toxins by, 215.
solubility in alcohol and glycerol, 608.
Variation in Kherson oats, 830.
Variations, origin, symposium, 329.
Variegation—
genetic analysis, 27.
in fern, genetics, 830.
Varnishes and colors, treatise, 891.

Vegetable—
ash, physicochemical analysis, 314.
diseases, manual, 246.
fats. (*See* Fats.)
juices, effect of storage on antiscorbutic value, 567.
oils. (*See* Oils.)
proteins. (*See* Proteins.)
Vegetables—
aphids affecting, 255.
carload shipments of, U.S.D.A., 91.
culture, Can., 340, 840.
culture and use, treatise, 640.
culture experiments, Minn., 139.
culture, treatise, 40.
disease resistant strains, 543.
extension work with, U.S.D.A., 695.
green, effect on blood regeneration, 867.
notes, Miss., 239.
shipments and unloads, U.S.D.A., 293.
thrice-cooked, for diabetics, 768; Mo., 462.
transplanting, studies, N.Y.Cornell, 36.
varieties for North Dakota, N.Dak., 239.
variety tests, Okla., 141.
Vegetation—
destruction, factors affecting, 117.
inhibitory effects of fruit on, 142.
strand, of Pacific coast, 823.
vertical distribution, 823.
water loss from, measurement, 17.
Velvet beans—
feeding value, 570; U.S.D.A., 466.
variety tests, 133.
Vent gleet, notes, 279.
Ventilation of animal shelters, station work on, U.S.D.A., 686.
Venturi flume, studies, Colo., 184.
Venturia inaequalis—
control, 754.
notes, Mass., 446.
spore dissemination, 548.
Vermicularia—
capsici, notes, 147.
herbarum on pinks, 49.
Verticillium—
alboatrum, notes, 546.
caulophagus, notes, 48.
Vesuvius, gas emitted by, electric conductibility, 828.
Vetch—
culture, Oreg., 638.
purple, value, Calif., 430.
solar energy used by, 508.
variety tests, N.C., 735.
Veterinary—
anatomical names, 77.
hygiene, treatise, 278, 884.
materia medica and prescriptions, 380.
medicine, biological diagnosis, treatise, 884.
medicine, laboratory diagnostic methods, 77.
officers in India, meeting of, 79.
(*See also* Animal diseases.)
Vibrion septique infections in animals, 677.
Vibrion septique, notes, Wis., 478.
Vigna angustifolia, rust on, 246.
Village—
planning, U.S.D.A., 193.
studies, American, 894.
Virginia Station, notes, 300, 698.
Viscum spp., notes, 148.
Vitamin A—
and chlorophyll, relation, 10.
and copper, relation, 865.
and phytol, 10, 408.
availability when injected, 265.
deficiency, effect on resistance against infections, 459.
deficiency in Denmark, 660.
deficiency in poultry, Calif., 477.
effect on quantity and quality of goats' milk, 275.
excessive in mother's diet, effect on young, 263.
free diet, preparation, 561.
in banana, 162.
in butter, inactivating action of fats on, 62, 377.
in butterfat, 864.
in butterfat, oxidation, 765.
in cod liver oil variously produced, 864.
in dogfish liver oil, 864.
in horseflesh, 764.
in yeast fat, 502.
physiological significance, 660.
requirement of swine, 571.
synthesis by fresh water alga, 765.
Vitamin B—
and carbohydrates, interdependence, 265.
and lactation, 163.
crystals from mung beans, 503.
effect on Azotobacter, 25.
effect on quantity and quality of goats' milk, 275.
in meat and eggs, 570.
in molasses, 660.
in wheat, effect of fertilizers, Ohio, 566.
in wort, effect of fermentation, 204.
requirement, relation to size of animal, 566.
rôle in metabolism, 566.
studies, use of rat for, technique, 766.
synthesis by *Bacillus coli*, 163.
Vitamin C—
crystalline form, 608.
in canned and cooked apples, 566.
in canned spinach, 764.
in commercially concentrated orange juice, Calif., 458.
in green tomatoes ripened in a warehouse, Wis., 459.
in liver, Wis., 459.
in liver of chickens on scorbutic diets, 671.
in milk in Berlin, 265.
persistence in livers of rats, 866.
synthesis by germination, 9.

Vitamin—
D synthesis by *Bacillus coli*, 163.
deficiency, relation to muscle fatigue, 767.
(*See also* Avitaminosis.)
E, solubility, 565.
E, studies, 62.
factor in tuberculosis, 866.
requirements of animals, Ind., 167.
streptococcus, synthesis by *Bacillus coli*, 163.
supplements for orphan pigs, Iowa, 777.
Tsukiye, synthesis by coli bacillus, 163.
X, distribution in natural foods, 661.
X, studies, 62.
Vitamins—
distribution and function, 367.
effect on weak chicks at hatching time, 669.
fat-soluble, studies, 264, 865, 870.
general discussion, 660.
immunologic significance, 381.
in cod liver oil, effect of hydrogenation, 765.
in grain sorghums, effect of ensiling, 67.
in preserved eggs, stability, 459.
studies, 62, 566, 764.
water-soluble, and bacterial growth, 162.
Vocational education. (*See* Agricultural education, vocational.)
Volcanoes, eruptive gases, effect on vegetation, 828.
Voles, control, 551.
Wagon and elevating grader, U.S.D.A., 483.
Wagons, draft of, Mo., 482.
Wales, social and agrarian study, 1284–1415, 393.
Wallace, H. C., memorial address, 597.
Walnut—
crown rot, notes, Calif., 449.
trees, young, dying out, 50.
Walnuts, black, grafting experiments, Mo., 436.
Warble—
flies in North Wales, 758.
flies in Switzerland, 758.
maggots, destruction, 584.
Washing machines, electric, 486.
Washington—
College, notes, 198.
Station, notes, 198.
Wasps—
and bees, life of, treatise, 56.
parasitic, inheritance of sterility and other defects, 525.
parasitic, revision of genus Microbracon, 861.
Water—
capillary rise in soils, 419.
clarification, relation to iron compounds, 683.
coastal ground, of Connecticut, 281.
conservation district No. 1, description, Utah, 483.
Water—Continued.
content of moor soils, effect, 118.
current meters, rating apparatus, 682.
cycle in plants, 824.
duty of. (*See* Irrigation water.)
for poultry, purification, 681.
fowl, British, treatise, 651.
hardness, effect on bleaching wood pulp 210.
hyacinth, eradication experiments, 32.
iodine content, in Utah and goiter, 369.
irrigation. (*See* Irrigation water.)
level and downward penetration of corn roots, 18.
level, constant, device for maintaining, 106.
loss from vegetation, direct measurement, 17.
movement in vascular plants, dynamics, 624.
pipes, frozen, thawing with electricity, 85.
power data of Canada, 789.
power investigation of Deep River, 587.
requirements of sugar cane, 17.
supplies of Michigan, iodine content, 86.
supplies, small, protection, 892.
supply of—
Colorado River basin, 281, 788.
Columbia River and Pacific slope basins in Oregon, 788.
Goose Creek basin, Idaho, 83.
Hudson Bay and upper Mississippi basins, 682.
Missouri River basin, 682.
New-Kanawha River basin, 83.
Ohio River basin, 83.
Pacific slope basins in California, 83.
South Atlantic and *eastern Gulf* of Mexico drainage basins, 683.
Utah and goiter, 463.
west-central Montana, 281.
supply system for farms, 487.
supplying power of soils, estimating, 116.
table fluctuations in Kearney Vineyard, Calif., 788.
table, relation to flow line of drains, 588.
weeds, control, 239.
Watermelon—
blossom-end decay, notes, 854.
wilt resistant strains, 543.
Waterproofing materials, master specification, 388.
Waters of great Australian artesian basin, composition, 281.
Water-soluble B. (*See* Vitamin B.)
Water-soluble C. (*See* Vitamin C.)
Weather—
Bureau, fruit spray service, 112.
conditions—
and crops, Minn., 112.

Weather—Continued.
conditions—continued.
at Newlands Experiment Farm, U.S.D.A., 812.
at Wooster, Ohio, 509.
in England, 1924, 15.
in south Mississippi, Miss., 211.
of Belle Fourche Project, U.S.D.A., 316.
of Umatilla Project, U.S.D.A., 316.
effect on fruit industry of United States, 111.
effect on white pine blister rust spread, 550.
forecasting and solar variation, 812.
forecasting, seasonal, 412.
forecasts as prevention of forest fires, U.S.D.A., 211, 718.
forecasts, weekly, of Argentine and solar radiation, 812.
insurance, developments, 615.
of the season, Minn., 113.
relation to cotton yield, 813.
relation to solar changes, 508.
(*See also* Meteorological observations *and* Meteorology.)
Webworm, garden, notes, 559.
Weed—
pest, new, in California, 238.
seed in seeds of Saratov Province, 36.
seeds in alfalfa, effect of dry heat, 135.
seeds, longevity, Iowa, 734.
Weeds—
and tillage, 791.
control, S.Dak., 436.
eradication in flax fields, 235.
in cotton fields, control by geese, N.Mex., 840.
susceptible to curly leaf, Calif., 449.
water, control, 239.
Weirs, suppressed, analysis of weir coefficient, 282.
Wells, protection, 86.
West Virginia—
Station, notes, 600.
Station, work and tentative plans, 96.
University, notes, 600.
Wheat—
aberrants and speltoids, cytological studies, 426.
American, buying for export, 593.
American, selling abroad, 594.
analyses, 666.
and Aegilops species, hybridization, 138.
and flax mixtures, culture experiments, Minn., 131.
and flax mixtures, tests, N.Dak., 334, 529.
and flour, studies, 311, 802.
black point, fungi causing, 750.
black point, pathological morphology, 749.
bran, cellulose, digestibility by fowls, 172.
bran, feeding value, 666.
Wheat—Continued.
breeding experiments, 230; Mo., 431; Okla., 133.
bunt. (*See* Wheat smut, stinking.)
by-products, feeding value, Minn., 170, 469, 575.
Canadian, marketing, 594.
composition, effect of soil temperature and moisture, 748.
cost of production, U.S.D.A., 489.
crop, world, of 1924, 593.
culture experiments, U.S.D.A., 333.
culture in New South Wales, 740.
cutting tests, Can., 530.
degeneration, 35.
durum, geographical center of origin, 138.
effect of irrigation, 531.
embryo, factor essential for reproduction in, 62.
experiments in Canada, 534.
export shipments, routing, 295.
fertilizer experiments, Ariz., 733; Can., 530.
fertilizer experiments, triangular, Ga., 230.
fertilizer nutrients required by, 216.
flour. (*See* Flour.)
foreign import duties on, 595.
germ extract, production and value, 865.
grading, Federal system, 314.
growers, price responsiveness, 393.
high-protein, production and marketing, Kans., 534.
hybrids, biannual cropping, 832.
hybrids with Aegilops, 332.
improvement, N.C., 735, 835.
industry in Kansas, relation to Hessian fly, 361.
inheritance of grain color in, 128.
irradiated, effect, 568.
kernel development, Can., 138.
leaf rust, strains, 646.
milling, and baking tests, Ariz., 734; Okla., 133.
moisture determination in, 715, 807.
North Dakota, protein in, N.Dak., 836.
nutrient requirements, R.I., 825.
nutritive value, effect of fertilizers, Ohio, 566.
of Crimea, 35.
of Stavropol, 138.
of Tunis, composition, 134.
optimum soil reaction for, 320.
Persian, in Transcaucasia, 35.
pickling machine, description, 350.
pools, Canadian, 594.
pools, organizing and operating, 594.
preparation for hog feeding, Okla., 171.
prices, relation to transportation costs, 593.
products, effect of aging, 311.
protein in, relation to physical characteristics, 839.
rate of manuring experiments, Minn., 119.

Wheat—Continued.
ration, balanced, cause of failure, Wis., 473.
rosette, control, Ill., 349.
rosette disease, intracellular bodies of, 848.
rotation and tillage experiments, U.S.D.A., 528.
rotation experiments, Wyo., 133.
rust infection at different stages, N.Dak., 334.
rust, relation to climate, 543.
rust, tests, Ga., 246.
rust, varietal susceptibility, Minn., 150.
seed protection from insects, 156.
seeding date, Iowa, 754.
seeding experiments, Can., 530; Minn., 130; N.C., 735, 835; U.S.D.A., 134.
seedling blight, factors affecting, 748.
situation, developments in, 796.
situation, international, 492.
smut—
control, Minn., 149.
control, modified and simplified hot-water treatments, 647.
dusting machine for, 486.
infection, cytological studies, 647.
stinking, control, 647; Ohio, 541.
studies in Kansas, 647.
soft, classification, 138.
solar energy used by, 508.
sources of information, 593.
spacing experiments, 527.
spring—
culture experiments, U.S.D.A., 132.
seeding experiments, Wyo., 133.
variety tests, Minn., 130, 131; N.Dak., 334; N.Mex., 131; U.S.D.A., 134; Wis., 432.
stems, insects affecting, N.Dak., 652, 857.
straw as fertilizer, Minn., 119.
surplus dispensability in United States, 594.
take-all, studies, 747.
time of cutting tests, Minn., 131.
varieties, Calif., 430; Okla., 133; U.S.D.A., 132.
varieties, baking quality, Ohio, 534.
varieties for Kansas, 528.
varieties of Sweden, 835.
varieties, rust susceptibility, Minn., 150.
variety tests, Ariz., 733; Can., 530; Ga., 230; Md., 832; N.C., 734; N.Dak., 529; U.S.D.A., 834; W.Va., 31; Wyo., 133.
western Canada, milling and baking quality, 534.
winter—
culture experiments, U.S.D.A., 132.
hardiness, correlation and anatomical characters, 231.
seeding experiments, Wyo., 133.
sowing, furrow drill for, Mont., 790.

Wheat—Continued.
winter—continued.
variety tests, Ind., 130, 431; Minn., 130, 131; N.Dak., 334; N.Mex., 131; U.S.D.A., 134; Wis., 432.
world situation, 394.
xerophytic, physiological characters, 238.
yield, effect of rainfall, 14.
Whey—
dried, feeding value, 172.
fruity odor in, 475.
manufacture of by-products from, 277.
pH value, measurement, 12.
zinc and copper dissolved by, 277.
White—
ants. (*See* Termites.)
flannel moth, life history and poison apparatus, 256.
fly, citrus, papers on, 856.
fly in California, 255.
grubs on sugar beets, Utah, 254.
grubs on sugar cane, control, 155, 860.
pine blister rust—
foreign studies, 651.
in Northwest, 651.
infection through grafted roots, 651.
spread, relation to weather, 550.
Whitewash, making and applying, U.S.D.A., 287.
Wichita National Forest and Game Preserve, U.S.D.A., 846.
Willows, oyster-shell scale affecting, Colo., 154.
Wind—
effect on tree growth, 441.
power for production of electrical energy, 891.
Window openings, air leakage around, 188.
Winds, ecological rôle, 15.
Winter injury, effect of soil types and treatments, 538.
Wire sieves, small mesh, effect of wear, 108.
Wireworm, white, economic importance, 257.
Wireworms—
control, 756.
economic, in Pacific Northwest, 363.
false, notes, 154.
notes, Utah, 254.
on hops, 554.
Wisconsin—
Station, notes, 99, 198.
Station, report of director, 497.
University, notes, 99, 198.
Women on farms—
insanity among, Ohio, 797.
treatise, 297.
Women's institutes in Canada, 899.
Wood—
cause of decay in, U.S.D.A., 356.
cellulose determination in, 110.
clover, culture, Iowa, 784.
distillation, 209.

Wood—Continued.
preservation, process for, 589.
preservation with arsenated petroleum oil, 812.
pulp, bleaching, 209.
pulp, cause of decay in, U.S.D.A., 856.
(*See also* Timber.)
Wood-destroying fungi of Java, 158.
Woodlot tax act, Mich., 892.
Woodlots—
as farm asset, Ohio, 599.
Cornell University, management, 345.
Woods—
of tropical American species, 347.
resistant to termites, 156.
Wool—
British, quality and production, 170.
chemical products, 718.
fibers, Merino, development, 370.
internal structure, 69.
review, annual, 667.
trade, international, 296.
yields from different groups of sheep, Can., 868.
Woolly aphid. (*See* Aphids, woolly.)
Work, effect on metabolism of goat, 664.
Worms—
in dogs, test of raw onions for, 865.
intestinal and cecum, in poultry, control, Calif., 449.
Wormseed oil emulsions, use against Japanese beetle, U.S.D.A., 455.
Wort, vitamin B in, effect of fermentation, 204.
Wyoming—
State experiment farms, service of, 195.
Station, notes, 199.
Station, report, 696.
University, notes, 199.
Xanthippus neglectus, notes, 756.
Xanthophyll, determination, 313.
Xanthophyll, preparation and properties, 501.
Xenopsylla spp., relation to plague, 758.
Xerophytes, drought resistance of, 518.
Xerophytism and leaf anatomy, relation to transpiring power, 123.
X-rays. (*See* Roentgen rays.)
Yams, variety tests, Guam, 430.
Yeast—
cells in dough, counting, 109.
effect on digestibility of feed, Okla., 172.
fat, vitamin A in, 502.
feeding value, 176; Mo., 469.
growth, effect of ammonium chloride, 105.
in dairy products, Iowa, 782.
ingestion, effect on leukocyte count, 458.
pellagra-preventive action, 662.
value for egg production, 670.
Yellow fever mosquito and dengue fever, 654.
Zaleptopygus sp., notes, U.S.D.A., 54.
Zamia palm destruction, 840.
Zinc—
and iron, comparative physiological importance, 364.
occurrence and function, 310.
plating, solution by milk and whey, 277.
Zonocerus elegans, summary, 358.
Zoology—
agricultural, of North Wales, 52.
Danish forest, treatise, 651.
Zygorhynchus mölleri, decomposition of proteins by, 310.